Chemical Age

NEW LABS. AT OLDBURY FOR A. AND W. (page 803)

VOL. 83 No. 2131

14 May 1960

THE WEEKLY NEWSPAPER OF THE CHEMICAL INDUSTRY

In the Chemical Industry

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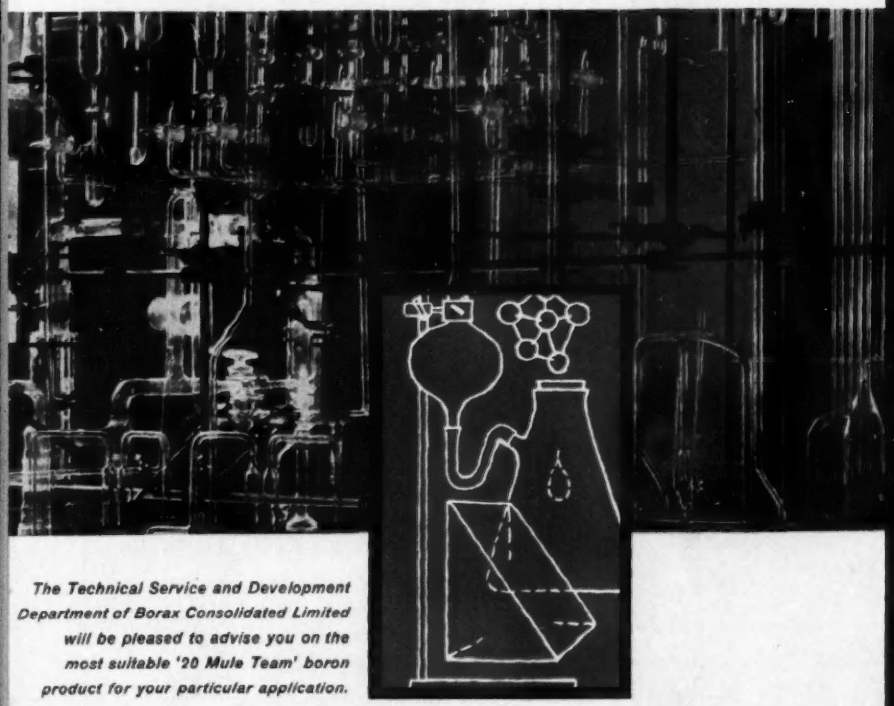

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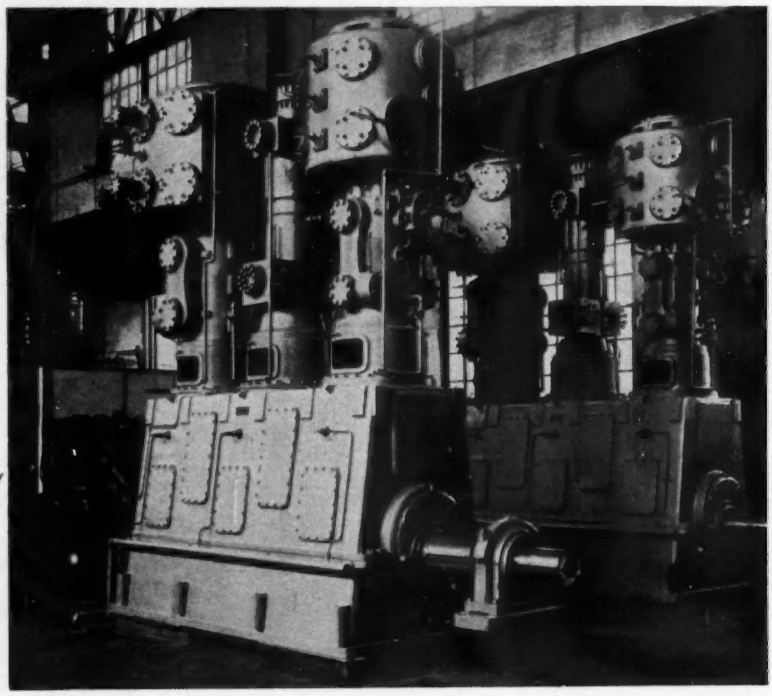

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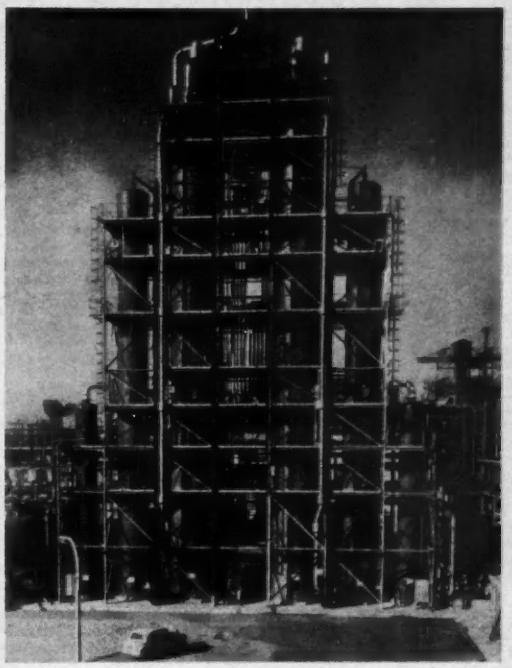

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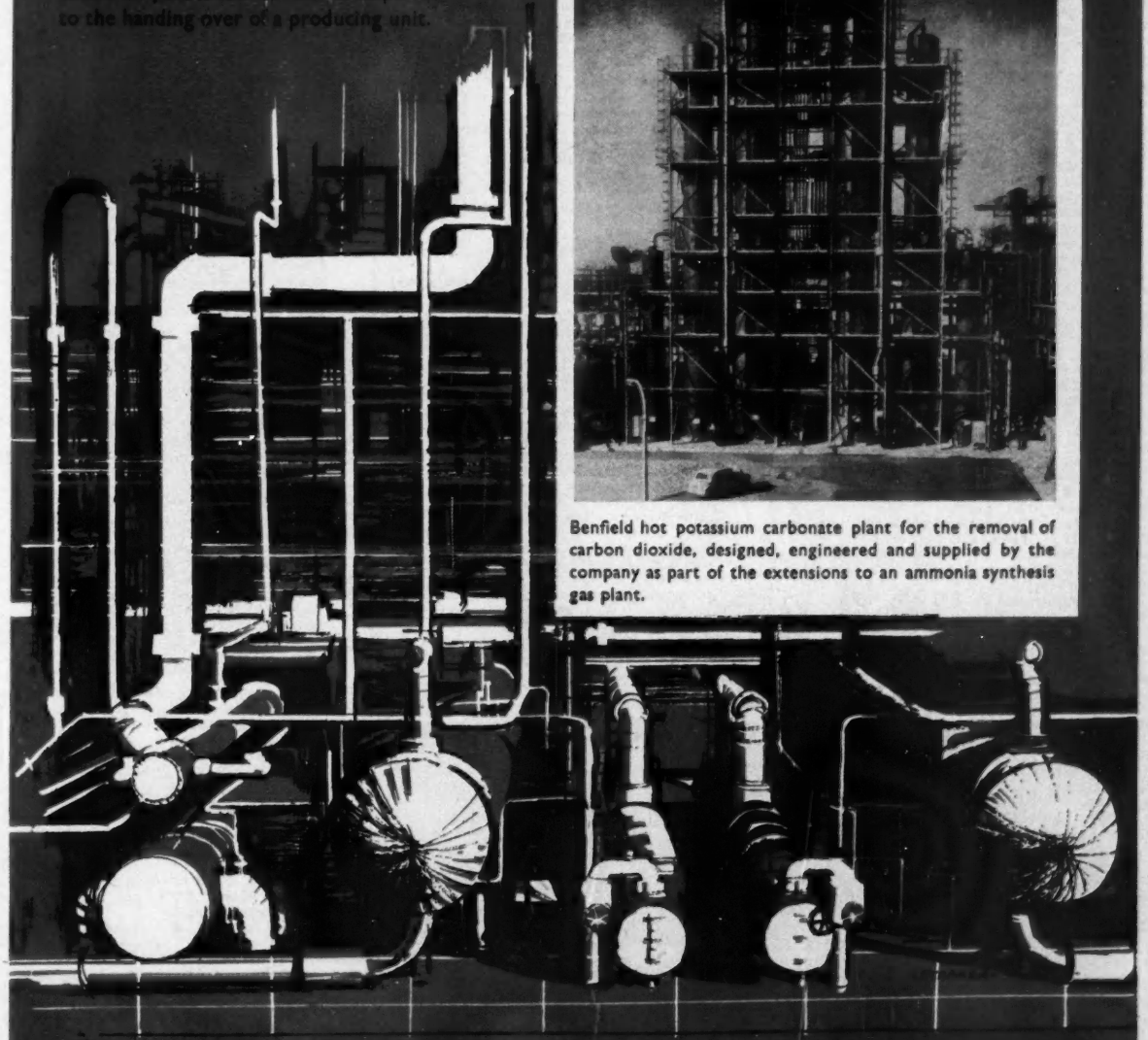

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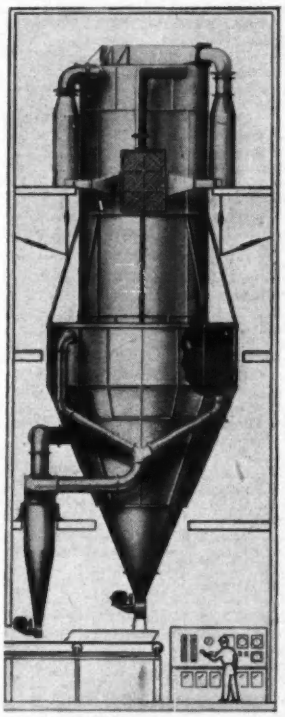

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KARBATE Entrainment Separators – Type MV are virtually immune to corrosion over temperature range from –40 to 170 deg. C Streamlined tear drop rod shape retards re-entrainment and provides minimum resistance to gas flow.

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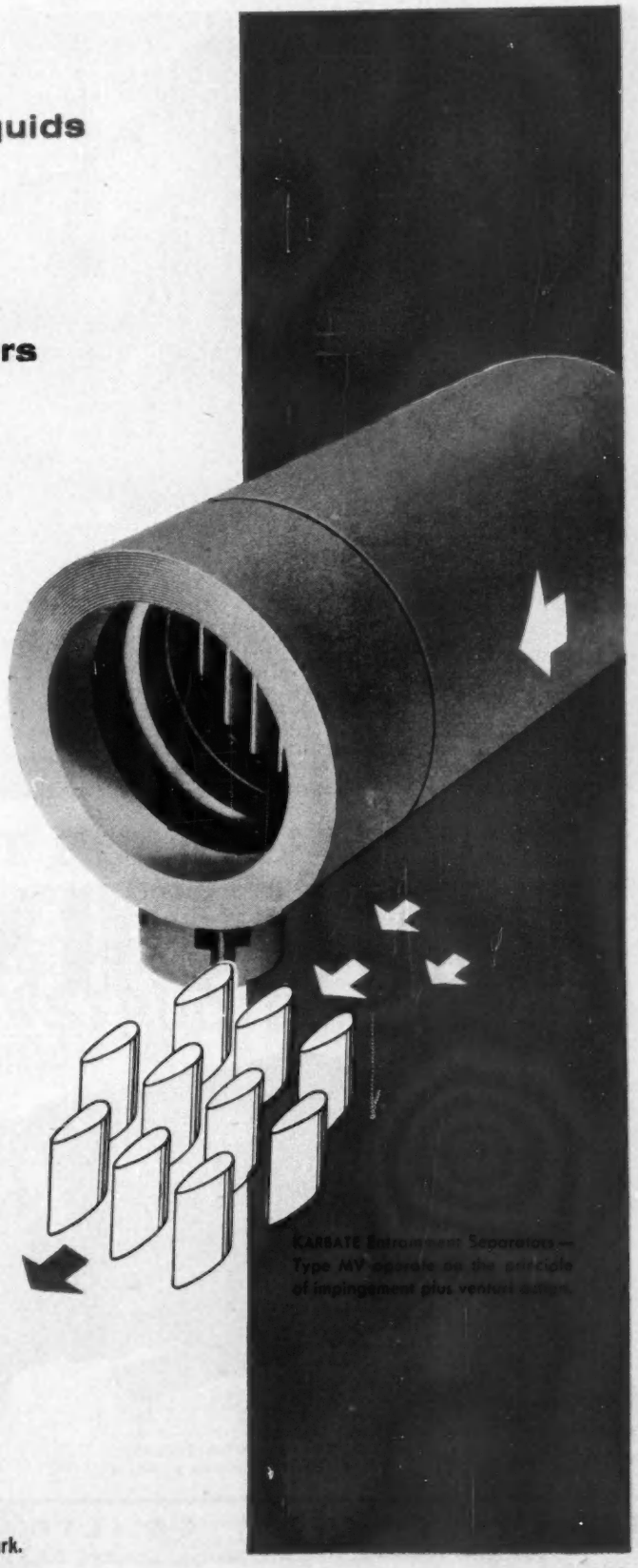

KARBATE Entrainment Separators — Type MV operate on the principle of impingement plus venturi action.

For more details on how you can benefit by using KARBATE Entrainment Separators, write to:
British Acheson Electrodes Ltd.,
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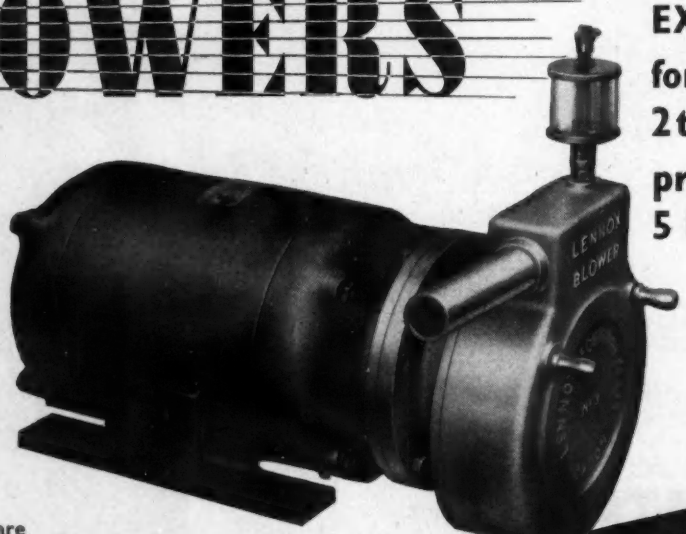

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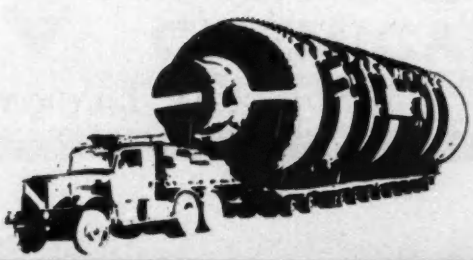

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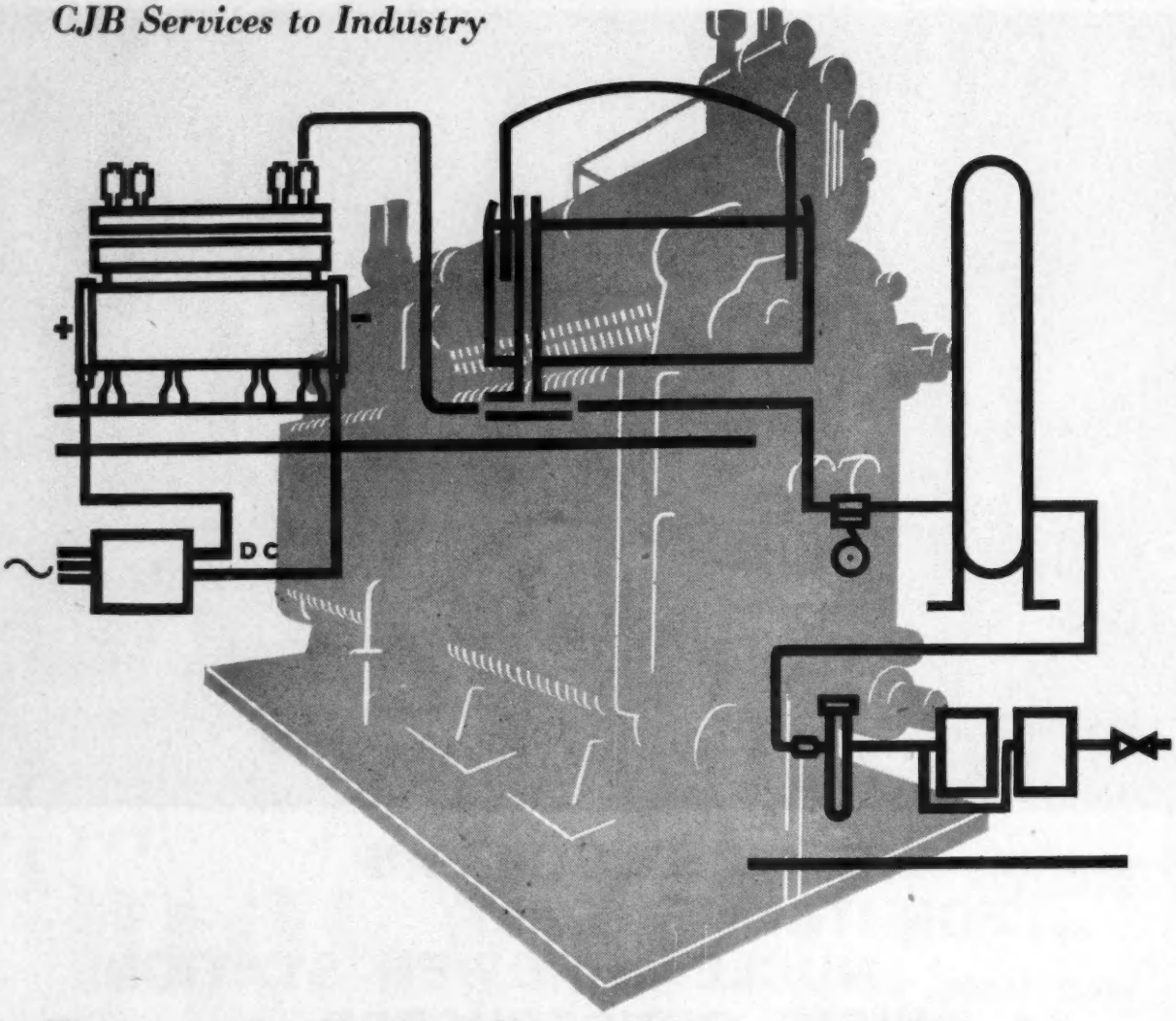

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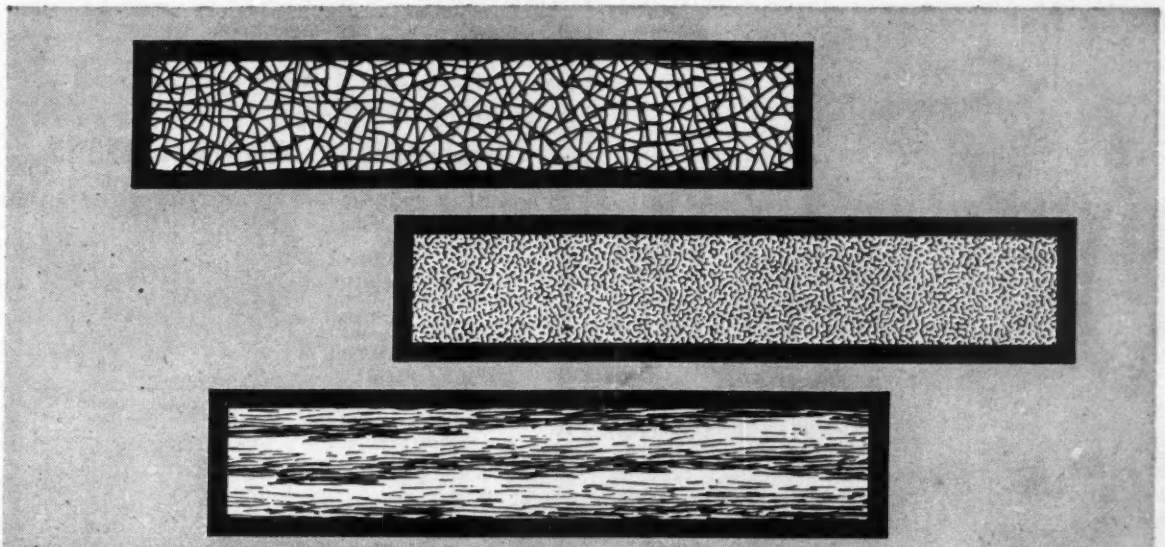

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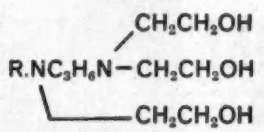

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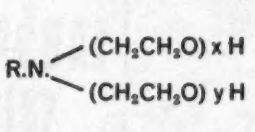

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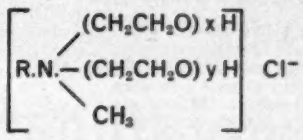

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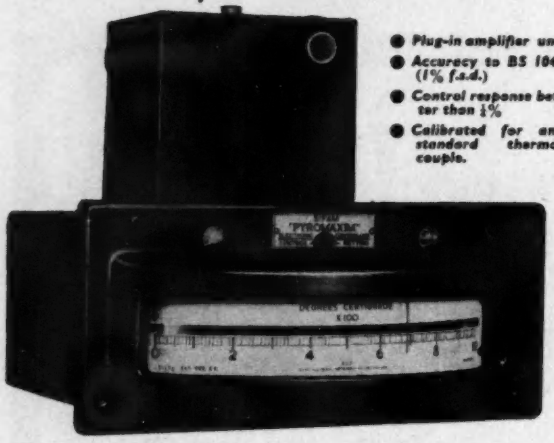

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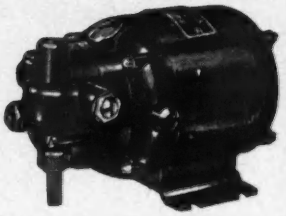

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150	24 oz. in.	18.8	4 lb. in.
100	32 oz. in.	12.5	4 lb. in.
75	36 oz. in.	9.4	4 lb. in.
50	3 lb. in.	6.25	4 lb. in.

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27	15 oz. in.	3.35	3 lb. in.
18	20 oz. in.	2.25	4 lb. in.

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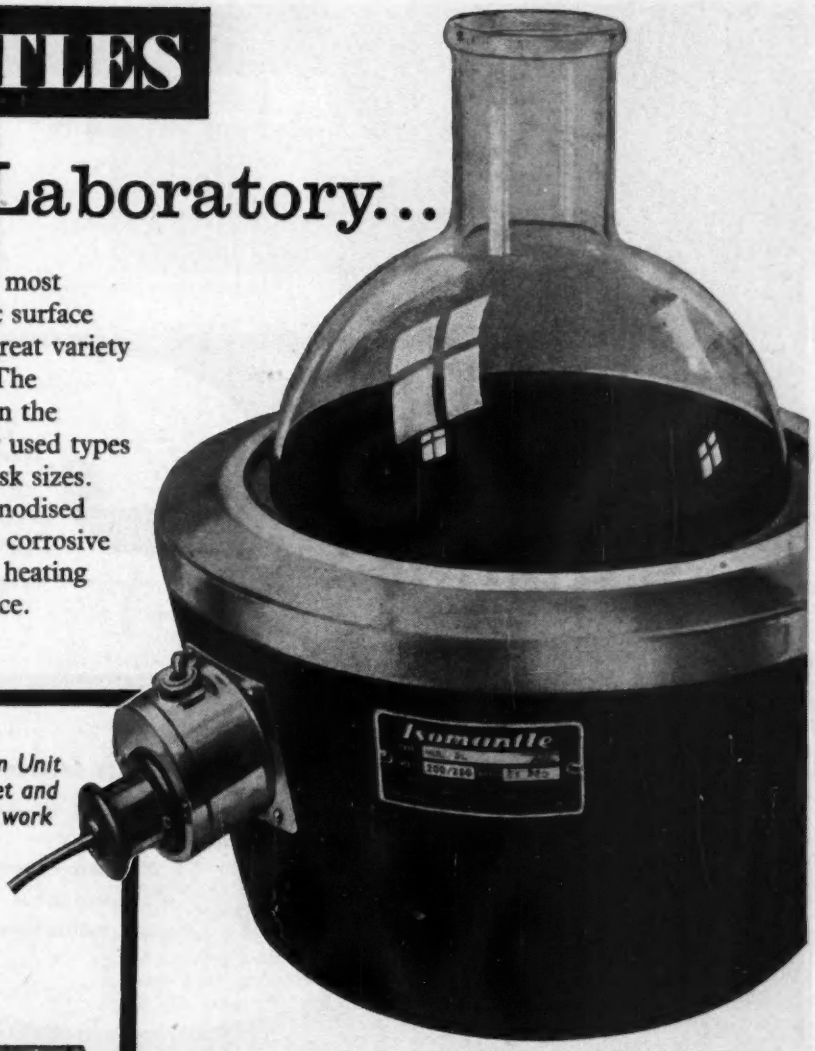

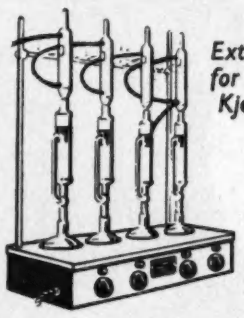

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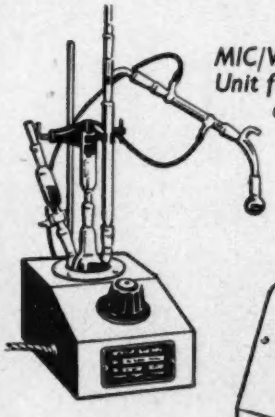

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MAY 14 1960

CHEMICAL AGE

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ECONOMICS OF RADIOISOTOPES

THE prospect of large quantities of radioactivity available cheaply as a by-product of nuclear power is making other important applications feasible that use very large radioactive sources, including the production of new chemicals, plastics and other raw materials with improved and novel properties.

Although 700 U.K. companies were regularly using radioisotopes in 1959, far more industrial concerns could with profit use these new 'tools' of the atomic age. There are many potential applications in manufacturing industry, quite apart from the well-known uses in monitoring thickness and level, in tracer techniques, in the measurement of mixing and bulk flow and in metallurgy.

Two factors which probably handicap the wider use of radioisotopes are misconceptions about safety aspects and lack of knowledge about economics. On the questions of economics, Dr. J. L. Putman, acting head of the Isotope Division of the Atomic Energy Research Establishment, speaking at a Scottish conference of the British Institute of Management on 30 April, said that a limited survey had shown that at least £3.5 million and probably nearer £7 million, was saved in U.K. industries in the financial year 1957-58. A potential saving four times as great was indicated if all firms in each industry adopted the methods now used by only a few. These savings arose from the partial adoption of a few well-tried radioisotope techniques; other 'winners' still under development could well increase potential savings by a further factor of 5 to £70 million or £100 million a year.

In a recent report entitled 'Radioisotopes in science and industry', the U.S. Atomic Energy Commission stated that as a measure of the practicability of using radiation in chemical processes, the relationship between process characteristics and energies from radiation sources had been analysed and source and process economics had been evaluated.

The number of tons of material that can be produced in a given process is directly proportional to the energy utilisation factor, the average molecular weight of the product and the effective radiation source strength. The formation of phenol from gaseous benzene-oxygen mixtures was taken as an example. Phenol has a molecular weight of 94; reported radiation production yields for the reaction vary from 50 to 214. A reasonable assumption for the power level of a cobalt-60 irradiation source was 30 kW. With allowances for the radioactive decay of the cobalt-60 and efficiency losses due to self-absorption, in the cobalt-60, that power level corresponded to about 2.5 megacuries.

Using those figures and the G value (energy utilisation factor) 214, it is reported that about 2,700 tons of phenol could be produced in the process per year.

Another example used a 30 kW source of cobalt-60 to produce some compounds for detergents now in common use. For the production of such compounds from hydrocarbons, sulphur dioxide and oxygen, typical value of radiation yield was 5,000 and molecular weight was 300. A total

annual production of about 200,000 tons might be achieved.

Those processes had relatively large energy utilisation factors. Less spectacular but interesting possibilities exist for processes having G values of the order of 10 and product molecular weights in the neighbourhood of 100 or 200. In that range a 30 kW cobalt-60 course could produce between 130 and 160 tons a year.

Products with large radiation yields and/or high molecular weights are less expensive in terms of radiation costs per lb. of product. For a process to be economically feasible it is necessary for the potential market to be large enough at current prices to be economically attractive. Also the cost of radiation must be low enough so that radiation plus other processing costs will leave a satisfactory profit margin at current market prices.

The A.E.C. report indicates that drastic cost reductions must be accomplished to make radiation processes attractive for other than very high energy utilisation values. For the phenol process, for instance, the cost per lb. for phenol produced by a 30 kW cobalt-60 source would be about 10 to 12 cents/lb. The present U.S. selling price of phenol is about 15 cents/lb. and it is obvious that a processing cost of 10 to 12 cents/lb. would not be acceptable. The estimate, however, is seen as encouraging since a reduction factor of about 4 or 5, in the price. would make the process attractive enough to warrant fulll-scale engineering and economic feasability analysis.

Because any form of radiation is potentially capable of large-scale production, the use of radioisotopes in heavy chemical industry must have a good future, particularly as in larger facilities the unit cost of products will reduce until the optimum size of operation is reached. If the cost of radiation is computed on the basis of actual curies consumed, present radiation costs are sufficiently low to make many possible processes worth examining.

So far as safety aspects are concerned, the Veale report on 'Training in Radiological Health and Safety' should dispel many fears. Among the many recommendations is the setting up of a national radiological advisory service to be operated independent of the U.K. Atomic Energy Authority. It would provide advice on the design of facilities and methods of health and safety control and services, such as the processing and interpretation of film badges, to users of ionising radiations who could not justify employment of full-time highly-qualified staff; to Government departments and to local authorities.

With these recommendations, backed by the Radioactive Substances Bill, which had its third reading in the House of Commons last week, the time is obviously coming when the wide scale use of radioisotopes will be considered normal practice by all types of British industry. Currently the A.E.A. is producing cobalt-60 on a very large scale rising to several millions of curies a year—sufficient to meet expanding needs of industry for processing materials by gamma radiation.

EGYPT AND PETROCHEMICALS

REPORTS from the United Arab Republic indicate that Egypt is to build up an important chemical and petrochemical industry in the near future. Key to this was the opening in January of the fertiliser plant built by a German-French consortium by the Aswan dam, which when completed in the course of next year, will have a production capacity of 500,000 tonnes of ammonium nitrate—with an N content of 102,500 tonnes a year—to be manufactured from the plant's own nitric acid and ammonium compounds.

In the water electrolysis unit—believed to be the world's largest—some 216 electrolysers are already working out of a total of 288 which from next year will have a combined capacity of 35,000 c.m. an hour. In the coming five years, plants will come into operation to give an initial annual output of 2,000 tonnes calcium carbide (later to rise to 5,000 tonnes), to produce ferro-silicon, carbon black and heavy water.

A plant which has been producing synthetic fertilisers based on petrochemical raw materials for some time is that of the Société Egyptienne d'Engrais et Industries Chimiques S.A.E. in Suez. Refinery gas from the nearby Shell refinery is used for its hydrogen. With new nitric acid plant, installed by Friedrich Uhde GmbH, a Hoechst subsidiary, last, year, production of calcium nitrate—250,000 tonnes last year—is to rise to an annual level of 275,000 tonnes. The Chemical Construction Corporation, New York, are now carrying out further extensions to this plant with the erection of sulphuric acid and ammonium sulphate installations. Raw materials for the acid plant will be imported pyrites and later refinery sulphur. The ammonium sulphate unit will come on stream next year with an initial annual capacity of 100,000 tonnes.

A general increase in petrochemical production will result from the raising of the total of the crude oil throughput of the three refineries in Egypt—the nationalised refinery, in Suez, that of Shell in the same place and that of Société du Pétrole d'Alexandrie—from 3,500,000 tonnes at present to 5,500,000 tonnes by the end of 1962. Indigenous oil output in 1962 will be, at an estimated 5 million tonnes a year, double the 1957 level.

The Ministry of Industry is planning the erection of two special cracking plants in the next two years. One of these will be a so-called 'coker', which will crack 1,650,000 tonnes of fuel oil grade into 160,000 tonnes of gaseous hydrocarbons for liquid gas production and chemical processing, 30,000 tonnes of sulphur and quantities of petroleum grades and coke. The second cracker will work with refinery benzene, and although no definite project has yet been decided on, the Ministry is understood to be considering facilities for a throughput of 100,000 tonnes of benzene for the production of 860 tonnes of hydrogen, 4,600 tonnes of methane, 3,650 tonnes of ethane, 340 tonnes of acetylene, 24,640 tonnes of ethylene, 13,600 tonnes of propylene, 580 tonnes of propane, 5,630 tonnes of butylene, 4,690 tonnes of butadiene, 290 tonnes of butane and 33,900 tonnes of high-octane benzene. On the basis of these organic chemical products, plant is to be installed for the annual output of 5,000 tonnes of p.v.c., 3,000 tonnes of other plastics, 28,000 tonnes of ethyl alcohol, 3,000 tonnes of dodecyl alcohol for the production of synthetic detergents, 7,400 tonnes of glycerine and 10,000 tonnes of synthetic rubber. In the same works area plant will be erected for the production of 10,700 tonnes of nitric acid and a further 7,400 tonnes of calcium chloride. Although offers are still awaited for most of the plant mentioned, it is expected that West Germany, in particular the Hoechst group, will be connected with the development. Erection of the two cracking units has already been approved.

Within a credit of 700 million roubles granted to the United Arab Republic by the Soviet Union in 1958, the Alexandria refinery will expand its throughput by 200,000 tonnes per year and Russia will build a plant for the annual output of 200,000 tonnes of calcium nitrate in Egypt, so as to put the country in the future position of being able to produce over 1 million tonnes of nitrogenous fertilisers per year.

Project News

I.C.I. to Raise P.V.C. Output by 10,000 Tons

● A FURTHER expansion of 10,000 tons/year is planned by I.C.I. Plastics Division for their vinyl chloride polymers plant. Due for completion by the middle of next year, this will raise capacity to about 80,000 tons; Hillhouse capacity was 55,000 tons in 1958. There will be parallel extension in p.v.c. compounding capacity, to be completed about the same time.

The increase to the present 70,000 tons has been due to applying new techniques to the existing plants The new extension is being designed and built by I.C.I. engineers.

● JOHN DALGLISH AND SONS, Glasgow, have been awarded the contracts for drying equipment for the first synthetic rubber factories to be erected in Brazil and in Australia. The contracts, representing exports worth £250,000, follow the £500,000 order which the firm recently received from Russia for rubber drying and packaging plant. The equipment for Brazil—four three-tier GRS rubber dryers—is for a refinery near Rio de Janeiro, operated by Petrobras, the State enterprise.

● FIRTH CLEVELAND INSTRUMENTS LTD., a member of the Firth Cleveland Group, are to supply the Gilbarco-Firth Cleveland automatic tank gauge for installation on 38 tanks at the new Slagen refinery for Esso Reffineriet, Norway. The order was placed through Bechtel International Ltd. The British company has also assembled a complete control console to house three remote reading receivers, Gilbarco bulk meters and their associated printers.

● EDGAR ALLEN and Co. Ltd., Sheffield, the parent company and one of their subsidiary companies, Buell Ltd., 3 St. James's Square, London S.W.1 have recently obtained orders for a mineral processing plant and two plants for drying, respectively, china clay and maize flakes. Total value of the orders is approximately £160,000. The Engineering Division will supply raw magnesite preparation equipment through the International Construction Co. Ltd., London, for installation at Salem, India. The plant includes a jaw crusher for the reduction of raw materials, a gyratory crusher, screens, feed tables, and a Stag ball mill fitted with Edgar Allen Cromax steel grinding plate reducing the product to 90% passing 30 B.S.S. Chromite and bauxite are also treated in the Stag ball mill, while the sintered magnesite is further crushed in a combination tube mill. The orders received by Buell include a Buell vertical turbo dryer for Watts, Blake, Bearne and Co. Ltd., Devon, china clay manufacturers, capable of drying china clay at the rate of 4½ tons per hour.

● A CONTRACT has been awarded by the Metropolitan Water Board to William Boby and Co. Ltd. for a small deaerator valued at £2,170.

A.B.C.M. REVIVE PLANT INSTRUMENTATION OFFER

GREATER publicity is to be given to an offer made in 1956 by the A.B.C.M. instrumentation advisory committee on a scheme for giving advice on the instrumentation of a complete chemical plant. This was decided at a recent meeting of the productivity committee of the council of the Association of British Chemical Manufacturers.

At the 1956 instrumentation appreciation conference held in Harrogate by A.B.C.M., Mr. A. J. Young (I.C.I.), then chairman of the instrumentation advisory committee, suggested that members who felt there was profit to be had by the better application of instruments in their own plants should send a short statement to the committee on the plants if they were thought suitable for study.

Mr. Young also said that if a number of A.B.C.M. members sent in such statements, the committee would select one plant for a careful case study. In conjunction with the makers and contractors it would produce a plan for the instrumentation of the selected plant, as well as an economic statement that would show the company's managing director what profit could be expected from the proposed instrumentation.

One obligation was attached to the offer. If the committee's proposals were implemented—as they naturally would be if the economic case were good enough—then the company concerned must allow publication of the case study and of the results subsequently achieved by the recommended instrumentation.

It is now stated that it should be understood that although publication of the case study would still be required, that would not involve mention of the company concerned by name. A.B.C.M. member-firms interested in the offer should contact Mr. G. Brearley, director, at Cecil Chambers, 86 Strand, W.C.2.

I.C.I. May Cut Unofficial Strikers from Profit-making Scheme, says Chairman

WHILE it was too early to make any forecast for 1960 as a whole, if experience to date was any guide, then 1960 should show further satisfactory progress. This was stated by Mr. S. P. Chambers, chairman of Imperial Chemical Industries Ltd., in Scarborough last week when he made his first speech to the company's central council.

In the past 10 years, total assets of the company, less liabilities, had risen from £286 million to £660 million. In the same period sales to external customers, excluding inter-divisional sales, increased from £221 million to £509 million, an almost proportional increase.

In the same period, the gross profit experienced as a percentage of assets had fluctuated from 11% in 1950 to 13.4% in 1951 and down to 8% in 1958. By 1959 the figure was back to 11.7%. The figures were much smaller after tax.

During his speech, Mr. Chambers referred to "the unconstitutional strike" at Wilton Works a few weeks ago. With very expensive plants, overheads went on whether the production was at 100% or less. Any interruption of production, particularly when all that was produced could be sold, could make inroads into the profitability of the plants involved.

Mr. Chambers added: "The question must arise in our minds as to whether in the future we are justified in including in the profit-sharing scheme for any year those people who by unconstitutional action have reduced the profit which would be available to all employees".

No decision had been made on the matter, but it required consideration, declared Mr. Chambers.

Ethanediol Anti-dumping Bill Could Mean Trade War by U.S. Firms, Says M.P.

THE U.K. makers of ethanediol had applied for an anti-dumping duty on imports from the U.S. on the grounds that it was being sold here at dumped prices and that this was causing them material injury, stated Mr. John Rodgers, Parliamentary Secretary, Board of Trade, in the Commons on Tuesday. Comments from those interested were now being examined.

Mr. R. Edwards (Lab. Bilston), asked Mr. Rodgers, when examining the application, to bear in mind the fact that until this year, the three applications were from large importers of the product from the U.S. and that an American firm had started a plant in this country. It was hoped that anti-dumping legislation would not be used in the way suggested in a trade war between two U.S. combines to the disadvantage of the British consumer.

Mr. Rodgers said that the application was being examined against three criteria which were laid down in the Customs Duties (Dumping and Subsidies) Act. These were firstly, whether dumping was taking place; secondly, whether it was causing or threatening material injury to the U.K. industry and if so, thirdly, whether an anti-dumping duty would be in the national interest.

★ I WAS delighted to hear the generous appreciation of the press made by Sir Owen Wansbrough-Jones, K.B.E., C.B., when he welcomed visitors to the new Oldbury Research laboratories of Albright and Wilson last week. Sir Owen admitted that A. and W. had been rather shy where the press and the public were concerned, but felt that to be not a bad thing and preferable to the opposite practice.

"We do", he added, "recognise the extremely important part that the scientific and technical press play in all our affairs . . . and we know we get a great deal of value from their efforts. Indeed we in common with all other chemical firms could not possibly get on without them". In return, Sir Owen declared that it was up to companies, particularly if they wanted the press to make an accurate appreciation of their worth to provide the information that the public, through the press, required.

In view of the fairly general—and sometimes quite justifiable—reluctance of chemical firms to release information, I particularly welcomed Sir Owen's reference to the appearance of items or comment in the press that "seemed unfortunate". From his general experience these "were almost always due to failure to provide responsible press representatives with adequate information, though at times it had to be incomplete".

★ CLOSING of their Bethnal Green, London, depot by Laporte Chemicals Ltd. marks the end of a long and colourful chemical era. Operations at Bethnal Green started in the middle of the 18th century and the original factory was in continuous operation for nearly two centuries. One of the oldest chemical factories in existence, hydrogen peroxide was produced there until the factory closed in 1939 and a move was made to a new plant in nearby Walter Street.

The business was acquired in 1851 by Mr. William Burton, who traded as Wm. Burton and Sons (Bethnel Green) Ltd. and it became a Laporte subsidiary in 1928. The building was severely damaged during the war is now to come down following an L.C.C. compulsory purchase order. The site is to become part of an adjoining park.

★ A PIONEER of accident prevention was how Mr. S. P. Chambers, I.C.I. chairman, described Mr. H. R. Payne, head of I.C.I.'s central safety department, who is retiring from this position. Mr. Chambers said Mr. Payne had been engaged on accident prevention or civil defence since 1933 and in that time he had seen the number of lost-time accidents drop from nearly 1,800 a year to 725 last year. This was achieved despite a rise in the I.C.I. labour force from 32,000 to 73,000 and represents a drop to one-sixth of the incidence 27 years ago.

Although the company's accident frequency rate deteriorated 2% last year to 0.462, the company still has the best safety record in heavy industry in Europe. The accident frequency rate for the second half of 1958, was 0.46, an improvement of 3% over the same period of 1959. The safety department's report for 1959, review in page 801, gives a rather more extensive review than usual of progress since the war.

★ FOLLOWING my note about the De Laval range of centrifuges in 'Distillates' of 2 April, I am interested to learn of a new development on the part of Westfalia Separator AG, Oelde, Germany, who have made centrifugal separators for more than 60 years. Although a large number of these machines are working on the Continent, they are not very well known in this country.

To rectify this position, a new U.K. company, Westfalia Separator (Great Britain) Ltd., Salisbury House, London Wall, London E.C.2, is now operating. This firm offers the whole range of some 200 models made by the German parent, with technical and after sales service. I am told that machines for every type of liquid-liquid-solid separation are available.

Special attention is given to equipment for the chemical industry. This includes separators for volatile and inflammable solvents—in which the separated products are discharged in an enclosed system under pressure, as well as separators arranged for the automatic discharge of the separated solids. All these can be supplied in flame-proof construction and have been tested by the Physikalische Technische Bundesanstalt (the German equivalent of the N.P.L.) who have granted certificates for all materials, except hydrogen, carbon monoxide, etc.

★ ALTHOUGH Dr. F. W. G. White, chairman of the Australian Commonwealth Scientific and Industrial Research Organisation is visiting the U.K. to attend the second International Wool Textile Research Conference at Harrogate in May, main interest centres on a paper he will give in Madrid in June. There he will report on scientific rainmaking tests in the Snowy Mountains which have raised rainfall on a selected area by some 15%. C.S.I.R. rainmakers mix silver iodide with sodium iodide and acetone and then pipe the mixture to specially designed burners fed with aviation fuel and fitted on the underside of both wings of an aircraft. When burnt in hot flame, the mixture produces particles that are so fine that they look like smoke. They induce the formation of ice crystals at a temperature as high as 23°F. A few shillings worth of silver iodide is enough to seed 1,000 sq. miles.

All that C.S.I.R.O. scientists need to make rain is a rain bearing cloud of the right type, in the right place at the right time. Of course the C.S.I.R.O. plane must be there, too.

★ NINTH book from the pen of Mr. Esward Gurr, managing director of Microme Laboratories, East Sheen, will be of great value not only in the laboratory, but also as a work of reference for all engaged in microtechnique. Entitled 'Encyclopaedia of Microscopic Stains,' every synthetic organic dye known to have been used in microscopy up to the end of 1959, with very few exceptions, is included in alphabetical order, with molecular weight, structure, percentage solubilities in various solvents, known usage, literature references, application suggestions, practical hints and much other data.

★ I WAS interested to learn something of the work when I visited the new laboratories last week of the Radiochemical Centre at Amersham. The organic department, for instance, is now producing about 230 C-14 compounds. There is an ample supply of carbon-14, which is now made in the reactors of the Atomic Energy Authority. New compounds recently added to the list include cortisone, cholesterol, EDTA, decamethonium bromide and nicotinic acid.

Production of such basic isotopes as iodine-131, phosphorus-32, sulphur-35 and gold-198 has been increasing at about 10% to 15% a year. Demand for several others, including chromium-51, potassium-42, sodium-24, iodine-132, iron-55, iron-59 and calcium-45, has grown sufficiently to call for their routine production. Progress has also been made with those isotopes that can only be made in cyclotrons, such as sodium-22, iodine-124 and arsenic-74. Altogether some 95 primary isotopes are now available.

Over 70 organic compounds containing phosphorus-32 have been synthesised including the insecticides Schraden, Systox, TEPP, Amiton, Parathion and Thimet. About 70 different compounds of sulphur-35 have been made, mainly for use by research workers in such diverse fields as rubber vulcanisation, flotation, detergents and the metabolism of sulphur amino acids. Economic aspects of the use of radioisotopes in chemical production are discussed in the leading article in page 797.

Alembic

TWO 1959 MELDOLA MEDALS AWARDED BY R.I.C. TO DR. CADOGAN AND DR. WADDINGTON

TWO awards of the Meldola Medal for 1959 are announced by the Royal Institute of Chemistry. The two candidates adjudged to be of equal merit in diverse fields were Dr. J. I. G. Cadogan, for his work in organic chemistry, particularly in reactions of free radicals in solution and in reactions of organophosphorus compounds; and Dr. T. C. Waddington for his work in physical and inorganic chemistry, with special reference to thermochemistry and reactivity of azides, photoconductivity of anthracene, lattice energies and i.r. spectra of inorganic salts, and liquid hydrogen chloride as an ionising solvent.

The Meldola Medal, the gift of the Society of Maccabaeans, is usually awarded to the British chemist, under 30 years of age, who shows the most promise in his or her published work.

Dr. Cadogan, who gained the B.Sc. at King's College, London, and who was Samuel Smiles prizewinner for 1950 and John Millar Thompson medallist for 1951, was, after receiving his Ph.D., appointed in 1954 to a fellowship tenable at the Chemical Defence Experimental Establishment at Porton, Wilts. He then became interested in the chemistry of organophosphorus compounds, an interest which he retained on returning to King's College as a chemistry lecturer in 1956. Since then he has continued his work in organophosphorus chemistry and in the reactions of free radical intermediates.

Quantitative Study

Dr. Cadogan has made a quantitative study of free radical addition reactions involving bromotrichloromethane and substituted stilbenes. This system has made possible a study of the influence of substituent groups on the direction and relative addition to the double bond, and the effects of solvents on the reaction. With Prof. D. H. Hey, a study of the decomposition of unusual peroxides has been undertaken to discover new sources of alkyl and aryl radicals.

His work on organophosphorus compounds has been on the reactivities of various classes of compound, and has included the reactions of several types of halogenating and oxidising agents with phosphorothioates and phosphites, novel rearrangements of piperazinium salts of phosphorothioic acids, the study of the alkylation and dealkylation of phosphorothioates, rearrangements under heterolytic and homolytic conditions of *N*-halophosphoroamidates and the study of some free radical reactions involving trialky phosphites.

In 1952 Dr. Waddington began research at Gonville and Caius College, Cambridge, under Dr. P. Gray on the thermochemistry, reactivity and structure of the inorganic azides. He received his Ph.D. and was elected a fellow of the college in 1955. Awarded a fellowship at the National Research Council of Canada, he worked on the photoconductivity of organic crystals, returning to Cambridge in 1956 to work in the inorganic chemistry laboratory. He gained an I.C.I. fellowship in 1957 and in 1958 was appointed a demonstrator in chemistry.

In the field of lattice-energy calculations, Dr. Waddington has extended the calculations made on the alkali halides and other systems containing spherical ions to systems containing non-spherical ions, such as the alkali-metal azides, bifluorides and cyanates, and has calculated the additional energy terms. In his study of anthracene, he has demonstrated the existence of two types of photocurrent—a bulk current, unaffected by the ambient atmosphere, and a surface photocurrent that is markedly affected by the gases present above the illuminated face.

The i.r. spectra and lattice parameters of the azides, the cyanates and the borohydrides have been studied; the relationship of the i.r. spectra and crystal structure of ammonium salts to the occurrence of hydrogen bonding has also been studied.

I.C.I. Safety Department Report Slight Fall in Accident Frequency Rate

THE 1959 accident frequency rate for I.C.I., based on the number of lost-time accidents that a payroll employee might expect to have during 100,000 hours, or his working life, was 0.462, compared with 0.453 in 1958, or a 2% deterioration. This is stated in 'Retrospect and Prospect', the 1959 report of the company's safety department, which also summarises post-war developments in safety.

The report states that I.C.I. passed their target frequency rate of 0.5 in 1958. Following the slight retrogression in 1959, the current year will see a new company-wide safety drive, for the safety department is determined to achieve before long the new target of 0.25—or only one accident during the working life of every four employees.

With the start of a new decade, safety work is said to be entering a new phase. Much of the spadework has been done; this will be followed by the no less difficult task of "cultivating and nurturing". There was a steep increase in 1959 in the number of I.C.I. works achieving a run of 1 million man-hours without a lost-time accident. The 29 'million hour' awards gained in the year were an increase of 50% on the previous best.

I.C.I. ACCIDENT STATISTICS

	1959	1958
Average no. of employees	73,176	74,173
Total man-hours ...	157,001,966	160,714,883
Fatal accidents ...	4	5
Permanent total & partial disablements ...	22	27
Temporary total disablements	699	698
Man-hours lost	185,284	177,291
Frequency rate ...	0.462	0.453
Durate rate*	257	245
Temporary partial disablements	371	287
Medical treatment cases	91,007	96,080

* Average number of hours lost per injury.

General Chemicals Division had the best lost-time accident frequency rate with a figure of 0.270 (0.324 in 1958), followed by Pharmaceuticals Division, 0.279 (0.271). At the other end of the scale Lime Division had a rate of 0.966 (0.615). The four 1959 fatal injuries were caused: by an explosion, during the repair of the hydraulic system of a lorry, a road accident, and following the trapping of a foot by a mobile crane. The 20 serious injuries comprised: amputation of fingers 5, eye injuries 4, burns 3, internal 2, fractured skull 2, spinal injuries 2, crushed hand 1, scalding 1.

A statistical breakdown of accidents shows the following: eyes 37 (47 in 1958); head/neck 73 (68); arms 45 (38); trunk 90 (106); strained backs 65 (46); hands/wrists 49 (42); fingers 80 (91); legs 99 (102); ankles 72 (66); feet 82 (71) toes 33 (51).

Human failing was responsible for 400 of the 725 accidents in 1959, followed by faulty working conditions, 122. Of the types of accidents, 222 were caused by falls by persons.

I.C.I. Ship Bulk Organics by New Channel Service

THE recently introduced road vehicle service between Felixstowe and Rotterdam is being used to carry bulk chemicals by I.C.I. Heavy Organic Chemicals Division from Tees-side. In some cases loads have been delivered to customers in Europe within 36 hours of leaving Wilton or Billingham.

This is part of the division's efforts to expand trade in Europe and plans are in hand to increase the number of products sent by the service and the number of destinations. So far bulk supplies of acetone and *p*-xylene have been sent to German customers, phenol to Holland and ethylene dichloride to France by this route.

Under the new service, the actual road tanker on arrival at Felixstowe is lifted by crane on board ship. On arrival at Rotterdam it is off-loaded and coupled to its traction engine. One of the advantages is that it has proved impossible to hire continental-type rail wagons with stainless steel bands, there is now much less risk of product contamination in transit.

A similar service is shortly to be introduced from near Dover to Calais.

Growing Interest in Biological Effluent Plants, say Simon-Carves

INTEREST in biological effluent treatment plants continues to grow it is reported in the April edition of *Group Review*, a journal of the Simon Engineering Group. The Simon-Carves coke oven, washery and mining department is actively continuing with its research and development of these plants. There are now seven full-scale units in operation, under construction and on order for treating carbonisation effluents in Britain and India. Many enquiries are being handled for the treatment of effluents from other processes.

The Simon-Carves gasification and ammonia fertilisers department reports that site work is now well under way in Guernsey on a continuous reforming plant; design and ordering of materials have been completed. A recent order has been for a Rummel twin shaft slagging gasifier for the North Thames Gas Board.

The chemical plant department states that Simon-Carves (Africa) have commissioned a sulphuric acid plant for Harmony Gold Mining and a sulphur-burning plant for Hartebeestfontein Gold Mines. Acid plants in India for Shaw Wallace and the Durgapur steelworks are in operation as are those for the Soc. Misr. de la Rayonne in Egypt and for Du Pont in Mexico. In France two sulphuric acid plants have been commissioned by the French licencees, Heurtey.

Acid Plant for Laporte

All but two of the principal new orders are for export. At home a 300 tons/day sulphuric acid plant is to be built at Grimsby for Laporte Titanium and a 50 tons/day plant at Brigg for the Farmers' Co. Three 50 tons/day plants have been ordered by three Indian firms (Jayshree Tea Gardens, Phosphate Co. and Andhra Sugars), while a 33 tons/day sulphur-burning unit is to be built for the Dutch State Mines.

Work is in hand on more than 12 precipitation plants, while a pyrites dust precipitator has been put to work for the I.C.I. sulphuric acid plant at Ardeer. Recent orders include an iron oxide dust precipitator for a converter operating the L.D. process at the Ebbw Vale steelworks of Richard Thomas and Baldwins, a mist precipitator for Monsanto Chemicals at Ruabon and a dust precipitator for Ferro-Alloys and Metals at Glossop.

The concentrated ammonia liquor plant and wet purification plant for the Northern Gas Board's reconstruction at Hendon are nearly completed and the three gas dehydration plants at Southampton, Reading and Hilsea for the Southern Gas Board are operating.

Electro-detarrers have been commissioned at Margam for the Steel Company of Wales and at Darlington for the Northern Gas Board. Three electro-detarrers have been ordered for R.T.B. at Newport, a gas cleaning plant extension by British Titan Products at Grimsby and a gas cleaning plant by Travancore Titanium in India.

For the S.-C. power plant department, the greater part of the civil and mechanical work on the ash handling plant at Hull for the Distillers Company has been finished and a boiler commissioned at Newport for Monsanto Chemicals. On behalf of British Resin Products, Barry, D.C.L. have ordered a 45,000 lb./hour oil-fired boiler and ancillary equipment.

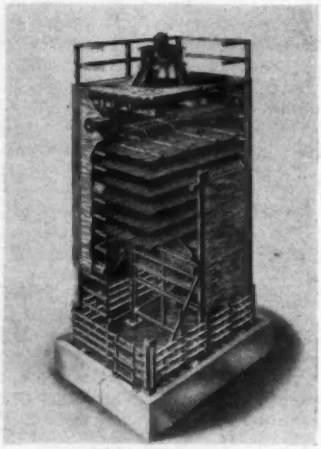
The building and civil engineering department has completed foundations for the phthalic anhydride plant which has now been built by Chemical Engineering Wiltons for Howards of Ilford. For Huntington, Heberlein and Co., new ground has been broken by an order, through S.E.E.S., for the supply of a plant to Soc. Française de Phosphate de l/Oceanie in the New Hebrides. Lodge-Cottrell Ltd. have more than 24 contracts for electrical precipitation plant in hand, including a stucco dust plant for I.C.I. at Billingham.

Chemical Engineering Wiltons have delivered to site nearly all the materials for the pilot pitch treatment plant for Lancashire Tar Distillers at Cadishead and erection is now in hand. New orders include a naphthalene plant for the North Thames Gas Board at Beckton and naphthalene refiners for Lancashire Tar Distillers at Cadishead.

An agreement to pool technical knowledge and resources has been made with Soc. Proabd of France, who now trade as Chemical Engineering Wiltons in the U.K. and Commonwealth. An agreement has also been reached with Lurgi of Germany under which C.E.W. can offer in the U.K. activated-carbon solvent recovery plants incorporating the Lurgi Supersorbon, Benzorbon, Desorex and Hydraffin processes.

New Cooling Tower by Foster Wheeler

A NEW cooling tower has been designed by Foster Wheeler Ltd., 3 Ixworth Place, London S.W.3, known as the type D, having an induced draught. It will cool water quantities between 50 and 1,500 gall./minute, and is constructed of treated timber, completely prefabricated.



Cooling tower, type D

The unit is delivered to site in sections for erection by unskilled labour, including the fan, fan ring and motor, all sections being simply bolted together.

The water collecting basin forming the foundation can be constructed of concrete, steel or other suitable material. The tower is available in sizes from 6 ft. by 6 ft. to 16 ft. by 6 ft.

Will

Mr. Richard Percival Allcock, of Disley, Cheshire, regional sales manager with I.C.I. Nobel Division, who died on 1 January last, left £19,818 net.

A.B.C.M. Circulates Data on Chemical Plant Deliveries

FURTHER action regarding collection of data relating to deliveries of chemical plant and equipment was discussed at the recent meeting of the productivity committee of the council of Association of British Chemical Manufacturers. A report of the meeting contained in No. 37 of the A.B.C.M. *Productivity News*, states that a questionnaire already circulating in the Midlands Area was approved for later circulation in the other five areas on a staggered basis.

It was agreed that a list of standard equipment currently available, to be submitted to the British Chemical Plant Manufacturers' Association, should also be circulated with a request for suggested additions.

It was agreed that Mr. A. P. M. Purdon (British Oxygen Co. Ltd.) should be invited to joint the productivity techniques advisory committee as a full-time member with experience in operational research.

Work to Start Soon on A.E.A. Research Centre

A BUILDING contract for the first phase of construction work at the U.K. Atomic Energy Authority's new research establishment at Culham, Oxfordshire, has been placed with Gleeson. The Culham site is to be developed as a laboratory for research into controlled thermo-nuclear reactions and plasma physics. Planning approval in outline was granted by the Oxford County Council in January.

The first buildings to be erected on the site will accommodate the large facilities needed for ICSE (intermediate current stability experiment) and its associated services. Further buildings will be added within the next two years or so to accommodate the remainder of the research being transferred to Culham.

A. AND W.'s RESEARCH WORK LEADS TO NEW PHOSPHORUS PRODUCTS AND PROCESSES

THE percentage expenditure on research of the Albright and Wilson Group is very close to, if not slightly higher than, the average for the chemical industry in this country, i.e. 5.9% of a net output valued at £734.9 million in 1958 (see CHEMICAL AGE, 23 April, p. 160), and there is no doubt that in the future the A. and W. expenditure in this field will increase.

This was stated in an address by Sir Owen Wansbrough-Jones, K.B.E., C.B., a director of A. and W. Ltd., on the occasion of a recent visit to the group's new centralised research facilities at Oldbury, Staffordshire.

Sir Owen said there was a healthy tripartite research collaboration between the Canadian subsidiary, Electric Reduction Co., Oldbury, and the research departments at Whitehaven of Marchon and Solway. Recently the Australian company had been authorised to increase its research effort. He added that two former heads of the Albright and Wilson research department were now respectively chairman and deputy chairman.

The following is a *résumé* of the work in progress at the various sections:—

Physical Chemistry. The work of the physical chemistry section includes improvements to the present electrothermal process for the production of phosphorus, ranging from the determination of thermal and electrical properties of new phosphate rocks to a study of new methods of condensation of phosphorus, expected to reduce the difficulties arising from phosphorus mud. Methods have been worked out for the treatment of the effluent from phosphorus furnaces, and other factory effluents are under examination.

Research is carried out into the utilisation of by-products and the section is also concerned with the development of new methods for the manufacture of phosphene, a chemical of increasing importance, and with polymers resistant to high temperatures.

Organic Laboratories. The work of the organic section is concerned primarily with the organic chemistry of phosphorus, but also includes organotin compounds and polyhalogenated hydrocarbons. One laboratory is also engaged on investigations of methods for the flameproofing of cellulose. The flameproofing laboratory has played a prominent part in developing a non-baking process for imparting durable flame resistance to fabrics while still retaining good handle and tear resistance.

The company already manufacture carbon tetrachloride and chlorobromomethane on a considerable scale. Work is in progress on various other chlorobromoalkanes for use as intermediates and as flameproofing agents for polymers.

Several dialkyl phosphoric acid derivatives $(RO)_2PO.OH$, in particular dibutyl- and dioctylphosphoric acids are of considerable importance in extracting uranium and thorium for atomic energy purposes. In general they are prepared either by back-hydrolysis from the neutral phosphate $(RO)_3PO$ or by hydrolysis of the corresponding dialkylphosphorochloridate $(RO)_2POCl$.

Dialkyl phosphites, readily available materials, are versatile intermediates for the manufacture of other organo-phosphorus compounds. They are best manufactured on a continuous plant by the reaction of an alcohol and phosphorus trichloride. The product is also redistilled on a continuous basis and a falling-film still used for purifying heat-sensitive materials is shown.

The dialkyl and diaryl dithiophosphoric acids are produced by the reaction of alcohols and phenols with phosphorus pentasulphide. These acids are of considerable technical importance being the basis of a wide range of oil additives, insecticides (e.g. malathion) and flotation agents.

Inorganic Chemistry. This section is mainly concerned with studying problems related to phosphorus and its inorganic compounds: a general study of the chemistry of the inorganic phosphates and the various forms of condensed phosphoric acids and their salts; laboratory investigations to find practical and economic ways of preparing phosphates and other phosphorus compounds not yet made by the company; development of new or improved methods of making compounds already in large scale production either at Oldbury or elsewhere in the group; work on the utilisation of by-products and wastes from works processes, and determination of the physical properties of phosphorus compounds and of other data required for plant design and operation.

A research chemist used a Van Slyke apparatus to determine free amino groups as part of a study of flame resistant materials

In the newly extended central research lab., Oldbury, work is being carried out on a new method of conductometric estimation of carbon

Process Development—evaluates chemical processes under plant conditions, acting as a liaison between the laboratory chemists on the one side and the plant-design engineers of the central engineering department or the production-plant managers on the other.

Laboratory scale operations are used for investigation of problems arising only after a process has been tried under plant conditions: semi-technical-scale work is a compromise between laboratory scale and plant conditions, and pilot plant scale, wherein there is no sharp boundary between the semi-technical scale.

Analytical Methods Lab. was primarily intended to develop methods of analysis in the research department but its scope has been extended to provide a complete analytical service to the department.

Current work in the analytical research sub-sections includes the development of methods for the determination of dibutyl tin compounds when present together with other tin compounds in various extractants, method for the separation and determination of xylenyl phosphates in the presence of cresyl phosphates, the analysis of mixtures of mono, di and tri alkyl phosphites. Work is also proceeding on the preparation of calcium standards for flame photometry; radiochemical techniques are being used for this particular work.

Equipment in the micro sub-section includes Pregl apparatus for the determination of carbon and hydrogen, a Belcher rapid train, Kjeldahl and Dumas nitrogen equipment and ebulliometers for the determination of molecular weights. In addition there are two experimental units. One of these is an apparatus for determining halogen in organic halides in which the halide is burnt in oxygen over platinum contacts in a closed system, the halogen absorbed in sodium peroxide and titrated amperometrically. The other experimental unit is a conductometric apparatus for the determination of carbon; in this the conventional absorption tube in the Pregl combustion train is replaced by a conductometric cell containing potassium hydroxide solution: $=0.29\mu g$ of carbon can be detected.

I.CHEM.E. MEETING ON SEALING AGAINST PRESSURE AND VACUUM

SEALING against pressure and vacuum was the subject of a discussion meeting held in Manchester on 26 April by the North-Western Branch, Institution of Chemical Engineers. In the first paper, 'The fundamental factors in valve design', Mr. H. E. Charlton gave various physical and mechanical factors that contribute to the tightness of valves; among them were surface tension and viscosity of the fluid, the introduction of viscous material between the valve seatings, the accuracy and surface finish of the valve and seat, the alignment of the various parts, the guiding of the valve on to the seat and the provision of an adequate force to keep it there. Valves were classified according to the cause of the seating pressure and the factors that influence the tightness of the seat.

Valves that depended on surface tension and viscosity for tightness were suitable for liquids, wet gases and vapours. Soft, resilient materials for sealing were suitable for liquids and gases, subject to the operating temperature limit for the material. For a tight seal against pressure, the valve had to be forced down, an example was the needle valve suitable for liquids and gases at the highest pressures. Surface tension could seal off the flow of a liquid provided the seating surfaces were not far apart and it also produced a force of adhesion between the surfaces. Standard valves could be used for a wide range of pressures and temperatures; the temperature limit for lubricated valves was, in general, 250°C.

Mechanical Seals

'Some experiences in the application of mechanical seals to pumps and stirred pressure vessels' was the title of a paper presented by Mr. V. J. Osola, who stressed difficulties rather than successes. He described a carbon ring mounted in a carrier which was secured to a rotating shaft, the ring being forced towards a stationary seat by springs in the carrier and by the fluid pressure. The springs acted through a Teflon ring which prevented fluid leakage along the shaft. The carbon ring might be designed to achieve some degree of balance of pressure. The effectiveness of the seal depended on the maintenance of a liquid film between the revolving ring and the stationary metal seat and most failures were caused by overheating this film. Mechanical seals were available up to 1,500 p.s.i and 250°C, or even to higher temperatures if a separate cooling system was used on the seal. Liquids maintained a liquid film more easily than gases and seals in dry gases must be provided with liquids. Corrosive substances might require an external seal arrangement. If the fluid pressure was greater than 100 p.s.i., a balanced seal was advisable, a seal was cooled by the circulation of a clean liquid.

The first example was a pump to circulate water in a pressurised system and the pump leaked at the gland. Water films were difficult to maintain but a mechanical seal was fitted. At first the leaks were bad but drastic alterations and re-alignment solved the problem. A second pump was used to pump a hot reaction mixture through a system under pressure, but it failed through many causes in spite of careful design. A design for a new shaft was prepared and the new shaft cured the trouble.

High Vacuum Closures

'High vacuum closures' was given by Mr. A. W. Avery, U.K. Atomic Energy Authority, whose gaseous diffusion plant is the largest vacuum system in West Europe. Rolled plate or forgings were used for vacuum tightness because castings were porous. The plants were tested for vacuum tightness, and to minimise out-gassing even the least porous materials must be kept clean during fabrication and be degreased before assembly. Welded joints were preferable and joints should only be flanged if they were to be broken and re-made frequently. Mild steel joints were welded by the electric arc process, aluminium and stainless steels by the inert gas/metal arc process. The quality of the weld varied with the position of the welder making it and trapped gas in welds must be avoided. Flanged joints should contain fully trapped rubber rings, the flanges should be very smooth and clean, and the metal faces should touch when they were tightened, also the packing was so constructed that the joint could be tested for vacuum tightness without evacuating the whole plant. The sleeve coupling for pipes had some faults and was used for temporary connections; the commercial coupling was better and the interspace block coupling was used mainly for connections for instruments and for sample lines. For valves, seals were required along the spindle and at the valve seat. The spindle might be sealed by a packed gland, by 'O' rings, diaphragms or bellows depending on the operating conditions. The best valve seats were rubber to metal or p.t.f.e. to metal; the metal must have a lapped and polished finish and it must be kept clean.

The isolation pressure rise test method for leaks consisted of pumping out the plant until the pressure was below 10 microns of mercury. The plant was isolated and the rate of rise of pressure in the plant measured by a Pirani gauge. If there was a leak, pumping was resumed at such a rate that the pump balanced the leak and the pressure was constant; the plant was probed by a jet of hydrogen and when the jet was turned on to the leak, the pressure rose because hydrogen would pass into the plant more quickly than air. The charcoal—Pirani method used a charcoal trap cooled by liquid nitrogen to absorb air and other gases and a Pirani gauge measured the increase in pressure due to the hydrogen which leaked in.

In 'High pressure joints,' Mr. W. R. D. Manning, said that because chemical plants needed cleaning, the joints had to be broken and re-made easily. A pressure joint had two parts, the seal and the coupling. The seal required a constantly maintained contact pressure and this pressure was reduced if the coupling was insufficiently rigid to withstand deformation or if creep occurred. A gasket was placed in a flanged and bolted coupling, and the bolt load was calculated from the working pressure and from the outer diameter of the gasket; this type of coupling was used for moderate pressures and an increase in pressure might burst the gasket. A burst was avoided by supporting or trapping the gasket; or, even better, by using a very hard gasket to induce plastic flow in the joint faces; that was the principle of the lens ring joint where the ring made a line contact on each side and afterwards indented the soft faces to produce a seal over a very narrow annulus of contact. An increase in pressure on those joints deformed the flange system and reduced the contact pressure on the gasket or ring. Increases in internal pressure automatically increased the contact pressure of the seal of a self-tightening device in which the contact surfaces were coned and the expansion of the ring wedged that ring tighter into its conical recess. The principle was carried further in the wave-ring joint where the seatings were parallel sockets and the direction of the contact pressure was at right angles to the axis of the pipe; the ring was usually softer than the pipe.

Bridgman Joint

In another self-tightening joint, invented by Bridgman, the axial load of the coupling was transmitted as a compression in a ring of plastics or elastic material. In another application of a similar principle, a tube was closed by a solid bung of elastic material forced into the bore in front of a steel piston which was supported from behind by a screwed plug. A logical development of the last device was the 'O' ring in a flanged joint. The 'O' ring was retained from behind and compressed at the sides, leaving a free side exposed to the pressure. An initial elastic nip provided a seal versus low pressures, while higher pressures in the pipe caused the ring to exert an increasing pressure on its other supports.

One class of seal required an axial force, in this case a bolt, to supply the contact pressure on the sealing surfaces; another class, for example, the wave ring and the 'O' ring, required no such force. A union connection was usually too large for convenience to use with the first class but the difficulty could be solved for an end closure by applying a final tightening by a ring of set-screws. The Vickers-Anderson system was used for self-tightening closures.

Steep Rise in U.K. Consumption of Sulphuric Acid

FIRST quarter 1960 consumption of sulphuric acid and oleum in the U.K. totalled 700,193 tons of 100% H_2SO_4, compared with 615,480 tons in the same period of 1959 and 615,324 in 1958. The increase was spread over most uses with a marked rise in the use of acid for titanium dioxide, the first quarter 1960 figure being 29,000 tons up on 1959. In following tables, published by the National Sulphuric Acid Association, Government plants are not included regarding acid production, raw materials used and trade uses of acid.

UNITED KINGDOM
SULPHURIC ACID AND OLEUM
Tons 100% H_2SO_4 (new acid)

	Contact	Chamber & tower	Total
Stock, 1.1.60 ...	76,978	25,066	102,044
Production ...	572,689	109,994	682,683
	649,667	135,060	784,727
Stock, 31.3.60 ...	72,637	19,602	92,239
Apparent Use ...	577,030	115,458	692,488
Total Capacity Represented (Tons/quarter)	621,850	193,580	761,430
Capacity in Use%	92.1	78.8	89.7

ACID & OLEUM CONSUMPTION
1 January—31 March

	Tons 100% H_2SO_4	
Trade Uses	1960	1959
Accumulators	3,642	3,103
Agricultural	528	298
Bichromate & chromic acid	5,487	4,496
Bromine	5,541	3,882
Clays (fuller's earth, etc.)	3,010	2,901
Copper pickling	591	614
Dealers	3,392	3,549
Drugs & fine chemicals ...	5,235	4,616
Dyestuffs & intermediates	26,697	21,203
Explosives	1,938	2,478
Export	3,516	768
Glue, gelatine & size ...	114	112
Hydrochloric acid ...	13,841	12,514
Hydrofluoric acid ...	3,636	3,182
Iron pickling (inc. tin plate)	36,876	28,189
Leather	1,015	1,130
Lithopone	4,004	3,026
Metal extraction	731	692
Oil refining & petroleum products	18,490	15,214
Oils (vegetable)	2,270	1,938
Paper, etc.	1,884	1,776
Phosphates (industrial) ...	1,063	538
Plastics, not otherwise classified	15,017	10,355
Rayon & transparent paper	75,499	66,091
Sewage	3,079	2,879
Soap, glycerine & detergents	30,894	32,774
Sugar refining	143	126
Sulphate of ammonia ...	76,245	71,895
Sulphates of copper, nickel, etc.	5,238	7,952
Sulphate of magnesium ...	59	35
Superphosphates & other phosphatic fertilisers ...	168,136	163,600
Tar & benzole	6,276	7,324
Textile uses	4,405	2,650
Titanium dioxide	115,241	85,999
Unclassified	56,460	47,573
Total ...	700,193	615,480

NOTE:—re acid production, raw materials used and trade uses of acid, all Governemnt plants are excluded.

Phosphorus/Nitrogen Compound Meets Textile Fire Hazard

A NEW flame-resistant finish for textiles has been obtained by Proban Ltd., an Albright and Wilson associate, by applying a pre-formed phosphorus-nitrogen mixture to the fabric and producing a polymer by chemical curing instead of by the more usual method of heat curing or baking. The polymer produced in this way has a completely different physical form from that produced by the original finish with the result that the fabric handle, strength and elasticity are not affected. The polymer contains a higher relative proportion of phosphorus than when a melamine formaldehyde binder was used so that a lower total weight add-on is required than with the original finish. This also helps to preserve the physical properties of the fabric.

The original Proban finish involved essentially the application to fabric of THPC and urea in the presence of a melamine formaldehyde formulation and triethanolmine followed by drying, baking and washing off. This finish suffered from a number of disadvantages, largely in processing. Great care was necessary in the selection and development of fabrics that would be suitable to carry the finish in order to avoid a harsh handle and loss in tear strength.

Because it does not affect fabric handle and strength, the new finish is of a much wider application than the original finish. Lighter fabrics can be processed and more rigid and tightly woven constructions can be treated provided they can be made sufficiently absorbent to ensure a good penetration of the finishing solution. With tight fabrics some firmness of handle may be obtained, but this generally responds to after-softening treatments.

The discovery means that for the first time a durable flame-resistant finish can be applied to the normal ranges of cotton, nightwear and party frock fabrics. Cottons in the new Proban finish can be given a cosy handle for children's nightdresses and pyjamas or can be crisp and stylish and safe for party wear.

The announcement of the new finish follows close on the heels of the publication by the Government of the Interim Report of the Committee on Consumer Protection in which the use of flame-resistant fabrics for certain forms of clothing — and specifically children's nightwear—was considered.

Under demonstration conditions, when various samples of fabrics treated with the compound—and a complete child's nightdress—were subjected to fire tests, the material charred into ash where it was actually in contact with the flame, but in no case was there any combustion. Handling qualities of most of the textiles, treated and untreated, were virtually the same.

World Fertiliser Interests Attend Rome Meeting

OPENING the two-day second informal meeting of representatives of the fertiliser industry at F.A.O. headquarters in Rome, Dr. Norman Wright, F.A.O.'s deputy director-general, said that "Without efficient use of fertilisers we cannot hope to achieve that increase in food production in food-deficient countries which lies at the heart of the freedom-from-hunger campaign."

Purpose of the meeting was to discuss the final draft of the report on a survey of the fertiliser economy of Asia and the Far East; and to consider the fertiliser programme of F.A.O.'s freedom-from-hunger campaign and the extent of participation of the fertiliser industry in that programme.

E.F.T.A. Regulations Now Available

THE European Free Trade Association (Origin of Goods) Regulations, were published recently, giving effect to the provisions of the Stockholm Convention for determining eligibility for Area tariff treatment. Information on the procedure to be followed to claim the benefit of the Convention rates of duty on goods imported into this country is published in Customs Notice to Importers No. 73, obtainable from the Secretary, Customs and Excise, King's Beam House, Mark Lane, London E.C.3.

New M. and B. Sales Branch for Ghana

A new branch of May and Baker Ltd. was opened at Tema, Ghana, on 4 May by that country's Minister of Health, the Hon. Imoru Egala. The branch will be concerned only with the sale of all the company's products.

RAW MATERIALS
Tons of material
Sulphur

	Imported	Recovered H_2S & filter cake	Pyrites	Spent oxide	Anhydrite	Zinc concentrates
Stock, 1.1.60	51,288	6,466	148,131	88,475	8,131	54,079
Receipts	102,651	13,221	64,884	60,887	193,117	45,730
Use	96,103	15,514	90,649	63,483	193,318	50,391
Adjustments*	4,408	−273	1,884	−1,364	−1,935	−217
Stock, 31.3.60	53,428	4,446	120,482	87,243	9,865	49,635
Acid made from above raw materials (Tons 100% H_2SO_4—total 682,700 tons)	280,200	43,100	118,600	83,700	114,900	42,200
Per cent of total	41.0	6.3	17.4	12.3	16.8	6.2

* Overall effect of stock adjustments, transfers & uses for purposes other than acid manufacture.

Joint Report Approves Decimal Coinage, Rejects Metric System

A STRONG case exists for adopting the decimal system of coinage in the U.K., but so far as the metric system of weights and measures is concerned, no recommendation for a compulsory change in the immediate future has been made.

This is shown in a joint report from the committees appointed by the British Association for the Advancement of Science and the British Chambers of Commerce to investigate the practicability of introducing decimal coinage and the metric system of weights and measures.

In their unanimous report published early this week the committees recommend the Government to take an early decision for the adoption of a decimal coinage, because the longer the delay the greater would be the transitional cost if a change were eventually made.

The benefits of a change to the metric system "appear to be small and outweighed by the extremely high transitional costs, particularly in engineering". But there was a general feeling that the system would in time become more widely used in the U.K. and the rest of the world. It was recommended that the Government should keep watch on the world situation and institute regular two-yearly reviews in consultation with industry and commerce and in conjunction with corresponding bodies in the Commonwealth and the U.S., to study world trends towards metric usage and decide on any appropriate action.

About a thousand replies were received to questionnaires sent to individual organisations, trade associations, chambers of commerce, learned societies, Government departments and other bodies, including British trade commissioners overseas. The committees' conclusions, based on these replies, are the result of two years' work.

New Stabiliser for Polyolefin Plastics

THE expectation that a combination of polymer and a new light absorber, Cyasorb UV 314, will solve problems associated with the degradation of polyolefin plastics due to weather action, has been expressed by Cyanamid of Great Britain Ltd., Bush House, London W.C.2, who are marketing the light absorber in the U.K.

Cyasorb UV 314, developed and produced by American Cyanamid at a cost of $10 per lb., is chemically 2,2'-dihydroxy-4-*n*-octoxybenzophenone, a pale yellow powder which absorbs strongly in the 300-375 millimicron range of the ultraviolet. Its long alkyl group at the ether linkage makes it compatible with polyolefins.

This new product has been tested extensively in both accelerated and outdoor exposure conditions by both Cyanamid and the plastics industry of the U.S. Even at absorber concentrations as low as 0.5%, low-density polythene retains 60% elongation after four months' exposure to severe sun conditions in Arizona. High-density polythene protected by 0.5% Cyasorb UV 314 retains 88% elongation after four months' exposure in Arizona. The high- and low-density polythene became so brittle without the use of the absorber within one and three months' exposure that the samples previously broke at a touch.

Cyanamid's newest ultraviolet absorber is designed for the building, agriculture, car and shipbuilding industries, and its greatest use is expected to be in applications for which polythene and polypropylene, because of their ultraviolet susceptibility, have not yet been considered. One lb. of Cyasorb UV 314 will treat from 200 to 500 lb. of polythene.

Coppee to Handle H_2S and CO_2 Removal Process

THE RIGHT to use the commercial Giammarco-Vetrocoke process for stripping acid gases from coke-oven gas, synthesis gas and hydrocarbon gases arising from petrochemical operations has been added to the activities of the Coppee Co. (Great Britain) Ltd., 140 Piccadilly, London W.1. The amine losses of the MEA processes are said to be avoided. The activated solution in the Giammarco process can be regenerated with much lower steam consumption; air can be used for regeneration in place of steam.

Special inorganic additives are said to increase considerably the rate of absorption and desorption of CO_2. CO_2 and H_2S can be removed separately or in the same operation.

Epoxide Resin Systems and Radiation

'INVESTIGATION of relaxation and recrystallisation in refractory carbides of titanium and tungsten' is the title of a newly released translation from the library of the Atomic Energy Research Establishment, Harwell, Berkshire. The authors are S. S. Gorelik; E. I. Mozzhukhin, and Z. Maier.

Two further releases have also been made: 'A comparative study of the allotropic transformations of uranium and iron and their structural consequences' by P. Lehr (a translation); and 'Some effects of radiation in cast epoxide resin systems' by I. D. Aitken and Miss K. Ralph. The latter is issued by the Engineering Division of the A.E.R.E., and is available from H.M. Stationery Office.

Acetylene Association's Annual Lunch

SOME sections of British industry seem hesitant about the wisdom of helping Commonwealth countries to develop their own industries, declared Sir Charles Goodeve, F.R.S., director of the British Iron and Steel Research Association, at the annual lunch of the British Acetylene Association held in London on 5 May. Proposing the toast of the association, Sir Charles said that if British industry did not help less developed nations to build up their own industries, then some other country would do so.

It was felt that there was a conflict between such development and our own export trade, and a conflict would exist were it not for the great technological changes that were taking place. Thanks to those changes Britain could continue to export new products and to manufacture higher quality products.

The toast was replied to by Mr. John Strong (British Oxygen Gases Ltd.), chairman of the association, who presided at the lunch. During his year of office, the association will celebrate its 60th anniversary.

I.C.I. to Spend "Several £million" on Nylon

Spending of several million pounds has been sanctioned by I.C.I. to expand nylon manufacture; and an additional plant is to be added at Wilton Works and modifications will be made to the Billingham works. Last year was a record for production of nylon, stated Mr. W. E. Humphreys, Billingham nylon works manager, recently. He added that British Nylon Spinners, their main customers, were continuing to expand and as long as they did there would be a rising demand for nylon.

Maydown Carbide Plant

Lord Chandos, chairman of the Northern Ireland Development Council, will open the new factory of Carbide Industries Ltd. at Maydown, Co. Londonderry, on 15 June. The company is a subsidiary of the British Oxygen Co.

DIARY DATES

TUESDAY 17 MAY

C.S.—Dublin: Univ. Chem. Lab., Trinity Coll. Centenary lecture. 'Chemical constitution & immunological specificity', by Prof. M. Heidelberger.

S.C.I.—London: Film Theatre, Mezzanine Floor, Shell Mex House, Strand, W.C.2., 6 p.m. Plastics & Polymer Group a.g.m.

WEDNESDAY 18 MAY

Inst. Plant Eng.—London: R.S.A., John Adam St., Adelphi, W.C.2., 7 p.m. 'Factory safety' by a member of Factory Inspectorate.

THURSDAY 19 MAY

C.S.—Manchester: Large Lecture Theatre, Chemistry Dept., Univ., 6.30 p.m. Centenary Lecture: 'Chemical constitution & immunological specificity', by Prof. M. Heidelberger.

FRIDAY 20 MAY

S.A.C.—Poole: Conference Room, Municipal Bldgs., 6.30 p.m. Meeting on 'Atomic absorption spectroscopy'.

Overseas News

NORSK HYDRO TO RAISE UREA CAPACITY TO 100,000 TONS/YEAR

UREA plant of Norsk Hydro, expanded last year to a 70,000 tons/year capacity, is to be further raised to an annual capacity of 100,000 tons. Output last year totalled 58,000 tons (42,000 tons). Magnesium capacity will be raised from 9,500 tons/year to about 14,000 tons; the extensions should be completed in the spring of this year.

Total output of nitrogenous products last year reached a record 242,100 tons, 11,500 tons up on 1958. Production of nitrate of lime (1,100,000 tons) was slightly higher; that of ammonium nitrate (41,000 tons) was slightly down. The complex fertiliser plant at Glomfjiond produced some 136,000 tons of A-type complex and the Eidanger Nitrate Works, 22,000 tons of B-type as well as 45,000 tons of C-type.

The new calcium carbide plant produced 23,500 tons and capacity is to be further raised after technical modification. Production of Norvinyl (p.v.c. emulsion and suspension) rose from 3,700 tons to 5,400 tons in 1959. Production of calcined soda totalled some 21,000 tons (20,000 tons) while that of calcium chloride was 25,000 tons (24,000 tons).

Sales volume last year reached Kr.515 million (Kr.493 million). Sales of nitrate of lime, ammonium nitrate and urea still account for 78% of the company's total sales.

Biological Nitrogen Fixation

Biological nitrogen fixation outside of living cells has been achieved by a team of four Du Pont scientists. They are Drs. James E. Carnahan, John E. Castle, Leonard E. Mortenson and Howard F. Mower and they now plan a direct attack on the problem of how the reaction takes place.

Expansion Programme for United Carbide

An $8 million increase, to $79 million, on research and development expenditure during 1959 has been announced by United Carbide Corporation. The corporation's annual report also gives news of a technical service laboratory for plastics to be located in Geneva and states that plant expansions due for completion during 1960 include those of affiliated companies in Italy and India.

Expansion of Erdolchemie's Chemical Plants

Second stage of the large new petrochemicals production plant of Erdolchemie GmbH, near Cologne, West Germany, is now being brought into commission. Erdolchemie, in whom B.P.'s German associate, and Farbenfabriken Bayer A.G., each have a 50% interest, completed the initial stage of construction during 1959, and the company's first four processing units have now been operating for 12 months.

A cracking and gas separation plant designed to treble Erdolchemie's previous output of ethylene is among the units now being commissioned, to form the basis of production of some petrochemicals. These include an ethanol (synthetic alcohol) plant, and a second plant, one use of which is manufacture of glycols.

Among units recently commissioned by the company is a hydrotreater, which removes gum-forming material from the gasoline produced as a by-product by the ethylene units. This plant, designed and developed by B.P., is believed to be first commercial-sized one of its kind for treating steam-cracked gasoline.

Change of Naphthalene Plans for Ashland Oil

The U.S. company Ashland Oil, have decided to build their synthetic benzene and naphthalene plant at Callettsburg, Ky., where their large refinery is situated, and not near the smaller refinery of their subsidiary, Frontier Oil, at Tonawanda, N.Y., as previously planned. The capacity of the plant will be 76 million lb. per year of naphthalene and 15 million gall. per year of benzene. This is about half as much again as originally planned. However, the Frontier refinery is still being considered for a smaller benzene plant with provision for naphthalene conversion, at some unspecified date. The reason for this change of plan is not disclosed.

U.S. Methods for High-purity Chromium and Yttrium

Studies that culminated in experimental production of high-purity chromium and yttrium metals by scientists at the U.S. Bureau of Mines, Albany, Oreg., metallurgy research centre are described in two new technical publications, available from the Bureau at 4800 Forbes Avenue, Pittsburgh 13, Pa.

Report of investigation 5589, 'High-purity chromium by electrolysis', discusses a series of experiments in which chromium metal was deposited in ultrapure form by passing an electric current through a hot solution of chromium trioxide. This study found that high-purity chromium can be made into sheets as well as wire. The metal has superior ability to withstand effects of high temperatures.

Report of investigation 5588, 'Preparation of high-purity yttrium by metallic reduction of yttrium trichloride', describes experiments in which yttrium trichloride was reduced to extremely pure metal by reacting it with hot lithium or sodium metal in a crucible filled with inert gas. High-purity yttrium was found ductile enough to be worked into a promising structural metal with potential uses in atomic reactors and missiles.

U.S.S.R. Buying French Chemical Plants

Tekhmashimport representatives are now negotiating with a number of French industrial concerns, including Schneider-Creusot and Petrole Chimie, for deliveries of complete plant and equipment and installations for the Soviet chemical industry.

A plant for sodium hydroxide production has been bought from the firm of Krebs, and deliveries will start this year. The Speichem company have sold the U.S.S.R. a large cellulose acetate plant, a department for the production of phosphoric acid, and an installation for acetic anhydride production.

$15 Million Ammonia Plant Planned at Joplin

Solar Nitrogen Chemicals, jointly owned by the U.S. companies Standard Oil Ohio and Atlas Power, are planning a new plant, costing $15 million, at Joplin, Mo., for the manufacture of anhydrous ammonia, urea, and related products. The ammonia plant is expected to start production in a year. Atlas, who already have major nitrogen facilities at Joplin, will operate the plant and Sohio Chemical will market the product.

O.M.'s New Hydrazine Plant For U.S. Air Force

Olin Mathieson are to build and operate their second anhydrous hydrazine plant at Saltville, Va. Engineering studies and the acquisition of equipment will begin at once. The cost of the plant, to be built for U.S. Air Force with government funds, is not disclosed. Olin Mathieson are the nation's only commercial producer of anhydrous hydrazine.

New Use for Chemicals in U.S. Space Satellite

The Project Echo satellite, which the U.S. National Aeronautics and Space Administration hope to launch at Cape Canaveral, is especially unusual in its use of chemicals. The sphere, a thin plastics balloon, will be kept inflated by the slow sublimation in the vacuum of space of a mixture of benzoic acid and anthraquinone.

Recovery of By-product Gypsum from Phosphoric Acid

Manufacturers have long sought a method for the recovery of gypsum left over from wet process phosphoric acid production. Allied Chemical's Barrett Division, U.S., have developed such a process, the first, they believe, that is

both practical and economical, which turns out a product comparable in quality with that produced from the highest purity rock. Barrett will use this process in a gypsum wallboard plant to be built at Claymont, Del.

Brazilian Firm to set up Superphosphates Plant

Cia. de Superfosfatos e Produtos Quimicos, of Brazil, will establish a plant in Capuava with an initial annual output of 40,000 tons of triple superphosphates (calcium 45-48%), in powder or granule. The plant will also produce 150 tons and 40 tons daily of sulphuric acid and phosphoric acid, respectively. The project will be carried out with the technical assistance of the French Kuhlmann group which was responsible, 10 years ago, for the establishment of the existing plants for the manufacture of sulphuric acid (120 tons/day) and calcium superphosphate (60,000 tons/year).

Polypropylene Film "Will Compete with Cellulose Film"

The Kordite Co., division of National Distillers and Chemical, believe they can compete directly with cellulose film in the packaging film market with their polypropylene film, Kordite 1500. Kordite claim that their film is stronger, having a tensile strength as high as aluminium metal, and will not weaken or embrittle with age.

Kordite 1500 is being produced 'semi-commercially' at the firm's Macedon, N.Y., plant, and is priced at present slightly below the cost of premium cellulose firm, but Kordite say that increased production will cut the price by more than half.

Dominican Republic Expanding Fertiliser Plant

The Dominican Republic firm Fabrica de Fertilizantes Quimicos at San Pedro de Macoris have commenced an expansion programme and are spending $100,000 on enlarging the plant's capacity, and production will be raised to 240,000 tons annually.

Montecatini and Trade with the East

According to a recent report from Milan the Italian chemical producers Montecatini are supplying superphosphate, titanium oxide and dyestuffs to Bulgaria, while the Italian synthetic fibre manufacturers Italviscosa have signed a contract worth $2,000,000 U.S. with Communist China for the supply of rayon and cellulose fibre.

U.S.I. Ether Hydration Unit Raises Ethyl Alcohol Capacity

A new ether hydration unit has been completed at the ethyl alcohol plant, Tuscola, Ill., of U.S.I. Industrial Chemicals Co., a division of National Distillers and Chemical. The new unit makes it possible for the company to take part of its ethyl ether production, formed as a by-product of its ethyl alcohol process, and convert it to ethyl alcohol. Potential capacity of ethyl alcohol, on a 190-proof basis, can therefore be raised to 6 million gall. a year.

Conversion to a low-proof ethyl alcohol is by a U.S.I. catalytic process. The low-proof product is then introduced into the regular process stream for conversion either to 190 proof or an anhydrous product.

Protecting Cooling Towers with Non-oxidising Chemicals

Following a 15-year survey on performance of a cooling tower serving Dow Chemical's styrene plant in Freeport, Texas, the company states that non-oxidising chemicals protect cooling towers, control algae and slime better than other chemicals. The company found that chemicals such as sodium pentachlorophenate or formulations containing blended chlorophenates were an improvement on previously used methods, including chlorine.

Spanish Firm to Produce More Ethylene, Methanol, Polythene

Unión Química del Norte de España plan to extend their works at Axpe, near Bilbao, for the production of ethylene, methanol and polythene.

German Subsidiary in Japan

The German constructor of synthesis gas plants, mineral oil refineries, chemical works and other industrial units, Heinrich Koppers GmbH, of Essen, has opened a subsidiary in Japan to control the company's considerable interests in the Far East. Based on Tokyo, the company bears the name Nippon Koppers Yugen Kaisha.

Creation of New Sulphur Co. in Sicily

A draft of law concerning the creation of a special Sicilian sulphur company controlled by the local government has been submitted to the Sicilian Government. This would authorise the assessor for industry in Palermo to set up a new company that would reorganise and promote sulphur industry in Sicily after having absorbed some existing firms and acquired interest in others in order to transform them into sound, full-cycle concerns.

Sofis, Ezi (Sulphur Board), and other public bodies will be allowed to provide capital for the new company. Private capitalists will also be permitted to invest in it but the aggregate private investments are not to exceed 49% of the whole capital.

Standard Oil on Stream with Polypropylene

Standard Oil of New Jersey have started producing polypropylene at their Baytown, Texas, plant. Until now, Standard Oil have supplied ethylene and propylene, the raw materials for polyolefins. The new Baytown plant, with an initial rated capacity of 40 million lb. a year, represents an investment of $30 million, including research and development work.

Montecatini Have New Polyolefins in Advanced Stage

At the annual meeting of the Societa Montecatini, Count Carlo Faina, president, stated that the company was preparing some new chemicals and that particularly promising progress had been made in the phosphorus field, in fluorine derivatives, and such special metals as titanium and zirconium.

As regards plastics materials and synthetic fibres, Natta-Montecatini discoveries concerning polymerisation of olefin have opened extensive new horizons. When the improvements at the plants in Ferrara and the new plant at Brindisi are ready, the output of Moplen will total 30,000 tons a year. This figure is, however, not considered a top limit.

Other polyolefins are already at an advanced stage of preparation, while some others still present "sound grounds for optimism".

The associated Farmitalia, also operating plants at Settimo Torinese and in Milan, had expanded their output of antibiotics, hormones, tetracycline, vitamin B_{12}, etc.

Italy's Overseas Deficit in Chemicals Cut by 68% in Two Years Since 1957

THE Italian chemical industry is making greater progress than other industries. Increase in output for all industry in 1959 was 11%, that for agriculture was 3%, while the chemical industry achieved an increase of 19%. Output of synthetic textiles increased by as much as 30%.

Italy's adverse import-export balance, at Lire 700,000 million in 1957, was cut to Lire 400,000 million in 1958, and to Lire 279,000 million in 1959, an improvement over the two years of 60%. During the same period, the adverse balance of Italy's foreign trade in chemicals went down from Lire 250,000 million to Lire 8,000 million, an improvement of 68%.

Italian exports taken as a whole increased in 1959 by 12%, while exports of chemicals rose 25%, reaching a total of Lire 138,000 million. Chemicals account for only 8% of all Italian exports. As in previous years, the improvements in Italy's balance of foreign trade in chemicals were accounted for by three sectors: fertilisers (especially nitrogenous types), essential oils, and plastics materials.

During the period from 1953 to 1959, output of the Italian chemical industry was doubled. According to the latest statistics, this output was valued at Lire 1,305,000 million in 1958.

Output of petrochemicals has risen as follows, in terms of carbon content: 1954, 16,000 tons; 1955, 26,000 tons; 1956, 38,000 tons; 1957, 73,000 tons; 1958, 130,000 tons; 1959, 180,000 tons.

Chemist's Bookshelf

Advantages of NMR Spectroscopy

NUCLEAR MAGNETIC RESONANCE. By *J. D. Roberts*. McGraw-Hill, London, 1959. Pp. viii + 118. 46s 6d.

During the last dozen years nuclear magnetic resonance spectroscopy has developed into one of the most powerful methods of structure diagnosis and determination available to the organic chemist. It is important therefore that all chemists, and organic chemists in particular, be aware of the underlying basis of the method and of its particular advantages in solving certain fundamental but hitherto intractible problems. The present small volume represents Professor Roberts' attempt to inculcate such an awareness.

It is written for those with little or no previous knowledge of either nuclear or electromagnetic theory. It is the outgrowth of some 40 lectures and the treatment is elementary and illustrative rather than exact and comprehensive. Most of the examples of applications are drawn from high resolution proton resonance spectroscopy. This is understandable because the method, though applicable to many nuclei, is particularly sensitive to those of hydrogen. Indeed, it can even be used to study proton exchange kinetics in, for example, tautomeric systems and acid-water and alcohol-water mixtures, and for the analysis of complex reaction mixtures containing components with differently bonded hydrogen.

Professor Roberts is to be congratulated and thanked for having achieved so much in the short space of one hundred and odd pages. His book is the only available, simple, lucid. and reliable introduction to this important but really quite difficult subject. The quality of the production is in keeping with the high reputation of the publishers and the price is correspondingly elevated.

H. MACKLE

Handbook of Electrochemical Constants

Butterworths Scientific Publications have now published the *Handbook of Electrochemical Constants*, compiled by Dr. Roger Parsons, lecturer in physical and inorganic chemistry, University of Bristol. The contents are as follows: fundamental constants and properties of ions, salts and solvents; numerical values of some functions used in the theory of electrolyles; activity coefficients; thermodynamic properties of HCl and NaOH; thermal properties of electrolytes; equilibrium constants in solution; mold volumes of electrolytes and their temperature and pressure dependence; molten salts; equilibrium properties of electrodes; viscosity and diffusion in electrolytes; conductivity of electrolytes; kinetic properties of electrodes; surface tension, dielectric constant and repactivity; and appendix. The information is provided in table form.

Price of this handbook is 30s, by post 10d extra. In the U.S. the book is published by Academic Press Inc., New York.

COMPENDIUM OF NITRATION DATA

NITRATION OF HYDROCARBONS AND OTHER ORGANIC COMPOUNDS. By *A. V. Topchiev*, Translated by *Catherine Matthews*. Pergamon Press, London. Pp. 329. 90s.

In his introduction, the author gives no indication of his intentions in writing this book, and the reviewer has found it difficult to estimate his objective. It contains six chapters devoted respectively to; aromatic nitration, the mechanism of this reaction, aliphatic nitration, N-nitration of amines, the action of oxides of nitrogen on both aromatic and aliphatic compounds, and finally, nitration by means of organic and inorganic nitrates. The scope of the book is thus excellent, but the author's handling of the subject is very disappointing. The theoretical aspects of the subject are inadequately treated, even in the second chapter, and the coverage of modern work is generally poor. Thus, judged as a review of nitration or as a teaching monograph, this book has many shortcomings. In most respects, it is a practical book, a compilation of facts, and if it is judged as such, the book has some merit.

The first chapter, which is the worst, is a catalogue of reactions, often including full experimental details, but with no obvious connecting theme. The influence of substituents on orientation is never discussed, and no form of orientation rule is mentioned. Little attempt is made to rationalise or explain the facts described.

In the second chapter, the mechanism of nitration is given a historical treatment, about half of the 70 pages being devoted to the reiteration of obsolete ideas. Subsequent chapters follow much the same pattern, although the book does improve as it progresses. The third chapter, for instance, contains useful but incomplete accounts of the properties of nitroparaffins and nitro-olefins. In general, however, the author is content to list facts (often in chronological sequence), provide practical details, and record the opinions of others without comment. Only in Chapter 3 (p. 203 *et seq.*) does he attempt a critical evaluation of reaction mechanisms. There is no mention of infra-red or ultra-violet spectra in the book, and very little attention to the physical chemistry of the subject.

But the most disturbing feature of this book is its poor standard of chemical theory. The book abounds in pentacovalent nitrogen atoms; a substituted azoxybenzene is represented (p. 36) in the pre-1920 form, with the oxygen linked to both nitrogen atoms, in a three-membered ring. The author makes only two attempts to use electronic (curved arrow) symbols, and in one of these (p. 58), the arrows appear to be pointed in the wrong direction.

The reviewer finds it difficult to recommend this book to the general reader. It may interest a few historians, or serve as a compendium of nitration data, but it is not a book for students.

G. L. BUCHANAN

Basic Reaction Mechanisms

AN ELECTRONIC OUTLINE OF ORGANIC CHEMISTRY. By *S. Horwood Tucker*. University of London Press Ltd., 1959. Pp. xvi + 478. 63s.

In the presentation of theories of reaction mechanism two courses are usually followed. Either similar reaction types are collected under a heading such as substitution, or the reactions of functional groups are dealt with individually and mechanistic interpretations are added. Dr. Tucker's method is a compromise between these two; for example a chapter entitled 'Substitution versus elimination reactions' is followed by 'Alcohols—preparation'. This compromise is not successful as it leads to a disjointed presentation.

With this limitation, the book gives a reasonable coverage of basic reaction mechanism and some topics, for instance the reactions of Grignard reagents and addition to $\alpha\beta$-unsaturated carbonyl compounds are covered very fully. The Cannizzaro and Schmidt reactions have been allotted four pages each but the strengths of acids and bases are dismissed in seven pages. As usual in books on this subject, free radicals receive less than their fair share of attention.

There are several errors of fact and understanding. As examples, equivalent quantities of phenyl magnesium bromide *do* give triphenyl carbinol (p. 201) and the counting of canonical structures is *not* a safe guide to stability or reactivity (pp. 83, 297, 448). Acidity of hydrocarbons (p. 222) and solvating power (p. 128) both appear as 'ionising power'. Further, by use of systematic nomenclature, expressions such as 'isoamylene', 'tetramethyl glycol' and many others could, with advantage, have been avoided.

This book, which is well indexed and well supplied with references, could prove valuable to both honours students of organic chemistry and post-graduates, provided that they possess a sound background of fact and a well-developed critical faculty.

C. J. M. STIRLING

Chemist's Bookshelf

Physical Chemistry Reviewed

ANNUAL REVIEW OF PHYSICAL CHEMISTRY, Vol. 10. Edited by *H. Eyring*. Annual Reviews Inc., Palo Alto, California, 1959. Pp. VII + 557. $7.

In a time of increasing numbers of research papers and journals and almost inevitable specialisation, critical surveys of new work in related fields are of great value. The current volume of this publication provides 19 such surveys of physico-chemical topics, each being contributed by an expert in the particular field considered.

'Thermochemical and thermodynamic properties of substances' (J. M. Sturtevant) deals with reaction calorimetry and gives some useful summaries of data for inorganic and organic compounds. Two Norwegian chemists contribute a review of 'Experimental molecular structure' which includes a survey of precision measurements. An article on 'Kinetics of reactions in gases' (A. F. Trotman-Dickenson) briefly considers advances in theory and discusses energy transfer and radical and other reactions. 'Properties of surfaces' (J. M. Honig) are discussed in terms of adsorption and the properties of surface layers and thin films.

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Other reviews are 'Electronic spectra of organic compounds' (J. R. Platt), 'Vibration-rotation spectroscopy' (R. M. Hexter), 'The solid state' (W. J. Moore), 'Nuclear and paramagnetic resonance' (G. K. Fraenkel and B. Segal), 'High temperature chemistry' (J. L. Margrave).

All the reviews are extensively documented with references which, in most cases, cover the period up to the end of 1958. The topics considered under each heading are necessarily somewhat limited but there appear to be few omissions. All physical chemists, industrial or academic, will find much valuable information in the book. Adequate author and subject indices are provided and the price, for a book of this type, is reasonable.

W. R. MOORE

Guide to Electrophoresis Techniques

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This little book which is most conveniently priced may be considered as an introduction to the subject and is particularly recommended to the student. It is certainly not, as the dust cover implies, the first book to cover all aspects of the subject. There are at least two other volumes which cover approximately the same field.

The text is divided into nine separate chapters, the first three of which are devoted to an exposition of the basic physical chemistry allied to the phenomenon of electrophoresis. The next four chapters deal with the practical aspects and describe apparatus and methods for carrying out electrophoresis in a supporting medium, on paper and by the classical moving boundary method of Tiselius. The final two chapters deal with preparative methods and with general applications of the technique. The last of these is very sketchy in character and rather heavily biassed in favour of the medical applications which are of only minor importance to the student.

Despite the fact that the book is very poorly indexed and the photographs of apparatus decorative rather than informative, it is a useful and reliable guide to the technique and is excellent value.

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There are 22 chapters which are in the main reasonably complete. An orienting survey introduces the book after which chapters 2 and 3 are concerned with proofs of the structure of cholesterol and the like acids. Following chapters review present-day chemistry of Vitamin D, oxidation, the -enes and -ols, ketones, displacements and rearrangements, sterols, methyl sterols, biosynthesis of cholesterol, the like acids and alcohols, oestrogens, androgens, progestogens, homo- and nor-steroids, adrenocortical hormones, cardiac-active principles, sapogenins and alkaloids.

Co-operation of a number of steroid chemists in reviewing copies of the manuscript has contributed greatly to correction and improvement of the book in advance of publication so that the final work despite its magnitude is remarkably free from errors.

For every worker in the steroid field, 'Steroids' is a must. It will also be invaluable to organic chemists for in the years since 1949, steroid chemistry has contributed greatly to organic chemistry. As the book indicates, development of selective methods for oxidation, reduction, substitution and elimination reactions have resulted from the need for specificity in multifunctional group molecules while detailed rotary dispersion studies have led to new routes to stereochemical problems.

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The arrangement of drugs is in accordance with their pharmacological affinities, except where a more chemical approach is justified, as in the general antiseptics, sulphonamides, organo-metalic compounds or steroids. The antibiotics produced by microbiological fermentation and isolated and purified by conventional chemical techniques are dealt with, in addition to those which might be regarded as truly synthetic products of the chemist's art. There is a useful table of the lesser known products of micro-organisms, with a summary of their chemical characteristics.

One or two statements in the text might mislead a chemist who is not regularly in touch with therapeutic trends; for instance, streptomycin sulphate is more commonly employed (at least in Britain) than the calcium chloride complex. The author's policy on nomenclature, which is to use the most familiar name, whether a trade-mark (denoted by italics) or a non-proprietary official synonym, sometimes proves confusing. The title Asterol which is applied to a double salt of ammonium tartrate and mercuric phenol-*p*-sulphonate is now the trade-name of a non-mercurial fungicide, diamthazol. Some more synonyms would help—for example oxamycin is better known in some circles as cycloserine, which is not quoted anywhere. The reader who is engaged in pharmaceutical chemistry may find the topicality of some sections uneven; the tranquillisers are well up to date, but there is no mention of that outstanding antiseptic chlorhexidine.

The text is clearly set out and lavishly interspersed with formulae and synthetic sequences. Each chapter has its own bibliographical list and there is a full index.

PETER COOPER

New Agricultural Chemicals Factory in Eire

Chemical Services Ltd., Upper Hatch Street, Dublin, have opened a new factory at Basin Street, Dublin, for the manufacture of weedkillers, fungicides, insecticides and animal feed products.

There are technical services agreements with Dutch concerns and these will provide research facilities to ensure that production will be on modern lines.

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Organic Chemistry Techniques

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This book, forming part of Volume I of the well-known *Techniques of Organic Chemistry* series, has been an invaluable guide and aid to chemists of all types since the publication of the first edition in 1946. New techniques and developments of older ones led to a second edition in 1949 and to this completely revised and augmented third edition. The original two parts of the book have now become four, permitting the grouping of related topics in each volume. Because of this, chapters on the determination of crystal form, crystochemical analysis, microscopy, determinations with the ultracentrifuge and of diffusivity are omitted from the new Part I and will appear in Part II.

Four new chapters are, however, included in Part I. Two of these deal with automatic control and recording respectively, both of increasing importance and applicable to many of the other methods described. The chapter on automatic control deals in detail with closed-loop control systems, linear servo-mechanisms, on-off control systems and the control of temperature, the last section replacing a chapter on temperature control in earlier editions. Under automatic recording the general characters and types of recorders and the forms of records are discussed together with some special features. Another new chapter, on weighing, considers the choice of balance, errors, types of balances and their adjustment, methods of rapid weighing and balance testing. The fourth, on determination of particle size and molecular weight, gives details of size frequency distributions, the selection of appropriate methods and the methods themselves including light scattering and colligative methods.

The remaining 11 chapters, on temperature measurement, calorimetry, and determination of density, melting and freezing temperatures, boiling and condensation temperatures, vapour pressure, solubility, viscosity, insoluble monolayers at interfaces, surface and interfacial tensions and osmotic pressure, are completely revised and extended versions of those in the previous edition and follow the same general pattern. New techniques and data have been added and in many cases new authors replace or join previous ones. Theory is given in sufficient detail, descriptions of apparatus and techniques are clear, there is a wealth of useful data and the scope and limitations of each method are clearly shown. Each chapter has an extensive bibliography and concludes with a list of general references. A subject index is provided.

It is inevitable that the time lag between writing and publication should result in certain omissions. Thus the unusually good semi-permeability characteristics of polyvinyl alcohol membranes described in the chapter on osmotic pressure have not been generally confirmed by later work. Such omissions are few, of a minor character and unavoidable and each chapter provides a critical review of apparatus, techniques and methods which is as up to date as is possible. Chemists of all types, and chemical engineers will find the book to be of as great as or greater value than its predecessors.

W. R. MOORE

History of America's Sulphur Industry

BRIMSTONE: THE STONE THAT BURNS. By *William Haynes*. D. Van Nostrand Co. Ltd., London, 1959. Pp. xi + 308. 45s.

Veteran industrial historian and economist, William Haynes, in 1942 published 'The Stone that Burns'. This new book is based on the earlier work. It tells the fascinating story of the U.S. sulphur industry from the earliest pioneering days, of the years of struggle and competition at home and abroad, and completes the picture with today's important new sulphur recovery developments in Lacq, France, and Canada.

Knowing many of the pioneers personally, Haynes has filled his book with vivid first-hand recollections—stories of the old Union Sulphur Co., and other early U.S. sulphur companies, of 'shoestrings' and 'blow-outs' and of the men who built the industry: Frasch, Swenson, Pemberton, Seeley Mudd, Aston Brady and 'Count' Rossi, of financiers who backed sulphur against long odds, and of the engineers who built plants miles from town or railway. Numerous illustrations are contained in the book, including photographs of the original Frasch operations at the pioneering Union Company.

All are familiar with the panic price cutting in sulphur following the large new production and the drop in U.S. consumption, coupled with reduced exports and the Lacq sulphur discovery in France. Haynes warns now against the optimism of the Mexican sulphur producers, because of the unsalubrious political atmosphere there.

As the story of the growth of an industry which today is changing radically, the book makes interesting reading. It is also a valuable reference work containing a wealth of notes and references and a large appendix full of statistical information. In fact, chemical market research investigators would gain much from studying this work.

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This book, forming part of Volume I of the well-known *Techniques of Organic Chemistry* series, has been an invaluable guide and aid to chemists of all types since the publication of the first edition in 1946. New techniques and developments of older ones led to a second edition in 1949 and to this completely revised and augmented third edition. The original two parts of the book have now become four, permitting the grouping of related topics in each volume. Because of this, chapters on the determination of crystal form, crystochemical analysis, microscopy, determinations with the ultracentrifuge and of diffusivity are omitted from the new Part I and will appear in Part II.

Four new chapters are, however, included in Part I. Two of these deal with automatic control and recording respectively, both of increasing importance and applicable to many of the other methods described. The chapter on automatic control deals in detail with closed-loop control systems, linear servo-mechanisms, on-off control systems and the control of temperature, the last section replacing a chapter on temperature control in earlier editions. Under automatic recording the general characters and types of recorders and the forms of records are discussed together with some special features. Another new chapter, on weighing, considers the choice of balance, errors, types of balances and their adjustment, methods of rapid weighing and balance testing. The fourth, on determination of particle size and molecular weight, gives details of size frequency distributions, the selection of appropriate methods and the methods themselves including light scattering and colligative methods.

The remaining 11 chapters, on temperature measurement, calorimetry, and determination of density, melting and freezing temperatures, boiling and condensation temperatures, vapour pressure, solubility, viscosity, insoluble monolayers at interfaces, surface and interfacial tensions and osmotic pressure, are completely revised and extended versions of those in the previous edition and follow the same general pattern. New techniques and data have been added and in many cases new authors replace or join previous ones. Theory is given in sufficient detail, descriptions of apparatus and techniques are clear, there is a wealth of useful data and the scope and limitations of each method are clearly shown. Each chapter has an extensive bibliography and concludes with a list of general references. A subject index is provided.

It is inevitable that the time lag between writing and publication should result in certain omissions. Thus the unusually good semi-permeability characteristics of polyvinyl alcohol membranes described in the chapter on osmotic pressure have not been generally confirmed by later work. Such omissions are few, of a minor character and unavoidable and each chapter provides a critical review of apparatus, techniques and methods which is as up to date as is possible. Chemists of all types, and chemical engineers will find the book to be of as great as or greater value than its predecessors.

W. R. MOORE

History of America's Sulphur Industry

BRIMSTONE: THE STONE THAT BURNS. By *William Haynes*. D. Van Nostrand Co. Ltd., London, 1959. Pp. xi + 308. 45s.

Veteran industrial historian and economist, William Haynes, in 1942 published 'The Stone that Burns'. This new book is based on the earlier work. It tells the fascinating story of the U.S. sulphur industry from the earliest pioneering days, of the years of struggle and competition at home and abroad, and completes the picture with today's important new sulphur recovery developments in Lacq, France, and Canada.

Knowing many of the pioneers personally, Haynes has filled his book with vivid first-hand recollections—stories of the old Union Sulphur Co., and other early U.S. sulphur companies, of 'shoestrings' and 'blow-outs' and of the men who built the industry: Frasch, Swenson, Pemberton, Seeley Mudd, Aston Brady and 'Count' Rossi, of financiers who backed sulphur against long odds, and of the engineers who built plants miles from town or railway. Numerous illustrations are contained in the book, including photographs of the original Frasch operations at the pioneering Union Com-any.

All are familiar with the panic price cutting in sulphur following the large new production and the drop in U.S. consumption, coupled with reduced exports and the Lacq sulphur discovery in France. Haynes warns now against the optimism of the Mexican sulphur producers, because of the unsalubrious political atmosphere there.

As the story of the growth of an industry which today is changing radically, the book makes interesting reading. It is also a valuable reference work containing a wealth of notes and references and a large appendix full of statistical information. In fact, chemical market research investigators would gain much from studying this work.

D.L.M.

NEW N.B.S. COULOMETRIC METHOD CAN DETERMINE ONE PART IN 100,000

A COULOMETRIC analytical method and a coulometric-titration coulometer, each providing a precision of 1 part in 100,000 for analysing and evaluating chemical standards, have been developed by the U.S. National Bureau of Standards. These tools for electroanalysis were developed by Dr. J. K. Taylor and S. W. Smith of General Motors' Delco-Remy Division, Anderson, Ind., for use in establishing purity of chemical standards and reference materials. The two methods together should provide a technique applicable to a large variety of analytical situations.

The Bureau's work shows that in accuracy and precision, coulometric methods can equal or surpass the most careful determinations made by classical analytical methods. Titrations reliable to a few thousandths of a per cent for both strong and weak acids can be obtained. The method is equally well-adapted to titrating bases.

Constant-current Coulometry. Bureau scientists have improved the constant-current method by designating a modified titration cell and a procedure for its use. The cell consists of two compartments—one containing a platinum cathode and the other a silver anode—separated by fritted glass discs. An alkali chloride solution is used as the electrolyte. For each faraday of electricity passing through the cell, a hydrogen ion is reduced at the cathode and one equivalent of silver chloride is formed at the anode. The fritted discs and an agar plug at the anode entrance isolate this electrode and also effectively prevent transfer of solution to or from the compartment.

Titration

To begin an analysis, the material to be titrated (acidic or basic) is put into the cathode compartment after the specially designed cell has been cleaned. A current of 200 ma is passed through the cell and held constant until more than 99% of the acid (or base) has been neutralised. The pH changes are indicated by a pH meter with glass and calomel electrodes. Finally, to reach the end point slowly, a small current is passed through at convenient time intervals. This current corresponds to the addition of a dilute solution in conventional chemical analysis. The pH is recorded after each interval, until the end point of the titration is just passed. By plotting a differential titration curve, the exact end point is located at the maximum of the curve.

The reliability of the constant-current method of titration was checked using N.B.S. standard samples certified for composition. Both the precision and accuracy were found to equal or exceed those obtained when using conventional chemical techniques of the most refined type. While the constant-current methods as developed by the Bureau have been largely used for acidimetric titrations, the apparatus and technique are applicable to many other determinations.

Controlled-potential Coulometry. Because of the selectivity of the controlled-potential method, this technique can be employed under conditions where the constant-current method suffers from interferences, such as simultaneous electrolysis of several constituents. In controlled-potential coulometry, the voltage is maintained at a specific value so that undesired side reactions are eliminated. In this case, however, the current decreases continuously and exponentially during the electrolysis. Thus it must be integrated during the course of the electrolysis. To perform the integration, the Bureau developed the coulometric-titration coulometer. This instrument makes possible much higher precision than the coulometers (i.e. integrators) previously available. Because hydrogen ions are involved, glass electrodes are used to detect the end point.

The improved coulometer is essentially an acidimetric titration cell with an electrolyte of hydroquinone dissolved in potassium chloride solution. The current that is being integrated oxidises hydroquinone to quinone and simultaneously liberates hydrogen ions. When the controlled-potential reaction is complete, as indicated by a low value of the electrolysis current, the polarity of the cell is reversed. The constant-current method is then used to restore the cell to its original composition. The product of the constant current and the time to restore the cell is equivalent to the integral of the current during the original reaction.

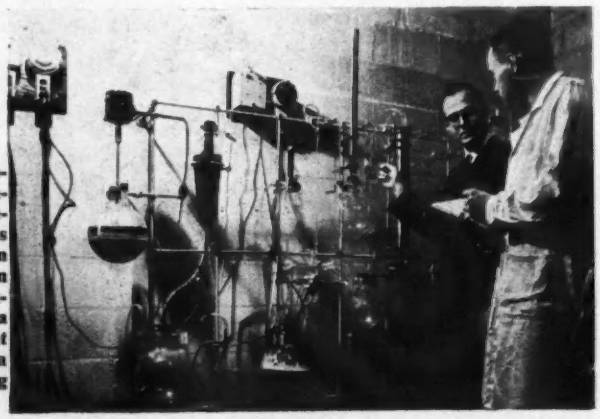
Boeing Develop Method of Producing Pure Water from Human Waste

WHAT is claimed to be a safe and efficient method of re-using human waste to grow food and provide pure drinking water for space-ship crews has been developed by scientists of Boeing Airplane Co., Seattle. If adapted to caravans, pleasure boats and areas with pollution problems, the system would, it is said, be low-cost and compact, producing a harmless solution for safe discharge direct into lakes or streams.

The equipment is a 'closed ecological system', where spacemen's food and oxygen are transformed into waste products. Bacteria are used to reduce waste matter to liquid form. Three products emerge:

Liquid which can readily be processed into pure drinking water; new bacteria to continue breaking down waste, with a surplus of bacteria which can be fed to certain animals; and a solution which promotes growth of green algae. Boeing have developed methods to transform algae into a palatable white flour for food preparation. Of equal importance is algae's ability to convert CO_2 to oxygen.

Since last August the experimental recycling system has successfully handled the waste products of persons on normal diets. Essentially all of this waste matter is converted to reusable forms. An improved, compact model for a manned closed ecological system will be set up later this year.



Dr. D. D. Chapman, left, of Boeing, who developed the process in co-operation with Washington University. Tabulating flow data on this pilot plant is R. H. Berg, a graduate working on the project

Rise in Chemicals Production Index

Index of industrial production, based on a 1954 average of 100, for the chemicals and allied industries in January stood at 134 compared with an annual average of 128 in 1959 and a January 1959 index of 123. January index for general chemicals was 134 (1959 average of 128 and January 1959 index of 122). Index for coke ovens, oil refineries, etc., in February was a provisional 141 (131 in January 1960, a 1959 average of 127 and 128 in January 1959).

PEOPLE in the news

● **Professor Sir James Scott Watson** has been appointed to the new post of agricultural consultant to Boots Pure Drug Co. Ltd., who have on hand numerous major projects for farmers and growers. Sir James, who is 70, has held various agricultural appointments, including that of chief scientific officer and agricultural adviser to the Minister of Agriculture.

● **Dr. A. G. Winn,** personal assistant to **Mr. R. A. Banks** ammonia and agricultural group director, I.C.I., has been appointed works manager of the Billingham Division plants which are being designed for the company's new Severnside Works. For the time being he will be attached to **Mr. P. Mayne,** Billingham technical director. He will be succeeded as P.A. to Mr. Banks by **Mr. G. H. Payn,** at present Billingham's deputy ammonia works manager. Mr. Payn will be succeeded by **Dr. P. G. Harvey,** Dowlais works manager, and the new manager at Dowlais will be **Mr. D. K. Peacock. Dr. P. W. Reynolds** has been appointed manager of the Billingham Division technical department.

● **Mr. J. S. Robison,** managing director of Evans Medical (India) Private Ltd., has returned to the U.K. after several years in India. He has been appointed sales manager at the company's London house at Ruislip, Middlesex.

● **Mr. T. J. B. Webb,** Dublin University, has been awarded an Exhibition to carry on research in chemistry. He will work at the Low-Temperature Laboratory at Cambridge.

● **Professor Nikolai Semenov,** director of the Institute of Chemical Physics of the U.S.S.R. Academy of Sciences, has been named for conferment of the honorary degree of Doctor of Science, Oxford University. This is one of the five such degrees to be given to mark the tercentenary celebrations of the Royal Society. Professor Semenov is distinguished for his work on chemical kinetics and the mechanisms of chain reactions.

Also among the five is **Dr. E. W. R. Steacie, F.R.S.,** president of the National Research Council, Ottawa, distinguished for his work in the mechanism of chemical reactions and the function of free radicals.

● **Dr. S. Husain Zaheer,** director of the Regional Research Laboratory (Council of Scientific and Industrial Research), Hyderabad, has arrived in London on a visit to the U.K. and Continental countries. He will attend the conference of the International Superphosphate Manufacturers Association in Venice, from 27 May to 5 June.

● **Dr. A. J. Harding,** exploratory group manager at the research department of I.C.I. Billingham Division, has been appointed project and process group manager in succession to **Dr. J. G. M. Bremner,** who has joined the board of Scottish Agricultural Industries Ltd. **Mr. S. W. Hawkins,** personal assistant to **Dr. J. Ferguson,** research director of I.C.I., will become exploratory group manager. **Dr. T. J. P. Pearce,** a section manager in the process and project group has been appointed group deputy manager.

● **Sir Thomas D. Nicol, K.B.E.,** chairman of Barter Trading Corporation Ltd., 69 Grosvenor Street, London W.1, and a director since the foundation of the company, retired from the board on 30 April. **Mr. George H. Duncan,** who has been associated with the company for over 40 years, has been appointed chairman.

● A rapid tour of European countries, including Switzerland, Germany and Italy has just been completed by **Mr. S. R. Cawley** and **Mr. P. Michelson,** directors of Tough Plastics Ltd., Byfleet Road, Addlestone, Surrey. The Tufplas bonding process, for which patents are pending in most European countries, invented in the U.K. by Mr. Cawley on behalf of the company, caused considerable interest among the many chemical and plastics companies visited.

● **Mr. E. S. Hiscocks, M.Sc., F.R.I.C.,** who is to succeed **Dr. R. A. E. Galley, B.Sc., Ph.D., F.R.I.C.,** as director of D.S.I.R. Tropical Products Institute, Gray's Inn Road, London W.C.2, is at present director of the U.K. Scientific Mission in Washington. Dr. Galley is resigning to take up an appointment with the Shell Group as research director and manager of the Woodstock Agricultural Research Centre, Sittingbourne, Kent. Mr. Hiscocks is 55 and has been in the U.S. since 1957 and is expected to take up his new position in the autumn. A former secretary of the National Physical Laboratory, he has also served with the Government Chemist's Department. He has made a special study of laboratory administration and has written a book on the subject. Dr. Galley, who is 50, has been a director of the T.P.I. since 1953 and is a leading authority on pesticides. He has been a member of the W.H.O. expert panel on pesticides since 1949.

● **Mr. Robert J. Davis** has been appointed to the new post of assistant manager for international chemical operations, by the Food Machinery and Chemical Corporation, New York, as part of an expansion of their international operations. Mr. Davis' duties will include management liaison with F.M.C. foreign subsidiaries and affiliates, and planning responsibility for foreign licensees. F.M.C.'s and carbon bisulphide licensees in Europe are included in the scope of the new position.

Market Reports

LESS PRESSURE FOR BASIC SLAG

LONDON Conditions on the industrial chemicals market have shown little change on the week, and the price position, with few exceptions, remains steady at recent levels.

The demand for the routine soda products, and for hydrogen peroxide, formaldehyde and the barium compounds has been reasonably good, and the volume of overseas inquiry continues to be satisfactory. Among solvents the price of isophorone has been reduced to £225 per ton for 1-ton lots in drums, the new price operating from 9 May.

A steady business continues in the fertilisers market, but reports indicate that there is less pressure for basic slag supplies.

Among the coal tar products, phenol crystals, creosote oil and cresylic acid are active on home and export account, while crude and refined tar are in steady demand.

MANCHESTER A fair number of fresh inquiries on both home and export accounts has been circulating on the Manchester chemical market and additions to order books have covered a wide range of products. Existing commitments are being drawn against steadily by industrial consumers, while the shipping movement has been well maintained at around its recent level. Peroxide of hydrogen has been reduced since last report to £138 per ton for the 35% grade, but otherwise the market generally has been held. The compounds and top-dressing fertilisers continue to move steadily into consumption.

SCOTLAND Another week of activity has been enjoyed in the Scottish heavy chemicals market. Buying has been brisk and from most sections of industry quite a full range of industrial chemicals has been in demand. The question of delivery has been a feature and in this respect emphasis has been on immediate requirements. Quantities are still being maintained at reasonable levels. The past week has also seen a continuance of activity as far as agricultural chemicals are concerned, particularly in regard to seasonal demands, and here again quantities are being upheld. Prices generally have shown little alteration. The report on exports is still one of interest and although there is always room for improvement, a reasonable level can be reported.

Commercial News

• B.D.H. Group Sales Reach Record £10 m.
• Higher Dividend and Scrip Issue for Greeff
• Manchester Oil Report Good Prospects
• Wimpey Secure Shell Polyolefin Contract

F. W. Berk

The issue by F. W. Berk and Co. of 1,680,000 Ordinary five shilling shares at 11s 6d a share has been accepted in respect of 1,625,000 shares. Applicants for up to 20 additional shares will receive allotment in full, while those for larger amounts will receive approximately 7% of their requirements with a minimum of 20 shares.

William Blythe

Every effort has been made by William Blythe and Co. Ltd to secure outlets for the increased production, states a recent chairman's report, and it is felt that there should be satisfaction with the increased trading profit of the group. Integration of the subsidiary with the parent organisation was achieved in the early months of 1959, and the board feel that this policy has been a contributory factor to the better profits. At the same time it was stated that increase in demand was accompanied by pressure on process both from home and foreign markets, which remained exceedingly severe.

Modifications have been carried out at the sulphuric acid plant and this is now in production.

Associated Chemical Companies

British Chrome and Chemicals Ltd. have changed their name to A.C.C. (Chrome and Chemicals) Ltd., and Brotherton and Co. Ltd. have changed to A.C.C. (Brotherton) Ltd. This is in accordance with a recent decision to link the names of the subsidiary companies in the group with that of the parent, Associated Chemical Companies Ltd.

British Drug Houses

Group sales of the British Drug Houses Ltd. for 1959 were a record at over £10 million, an increase of more than £3 million on the previous year. Figures for 1959 include 10 months of J. R. Gibbs and Rowland James Co. Ltd., acquired during the year, but would still have constituted a new level if allowance were made for the acquisitions, it it stated.

So far this year indications are that overall business is running satisfactorily, which should enable the company to give effect to the expectation of a dividend distribution similar to that for the previous year, said Mr. G. C. R. Eley, chairman. He added that it must not be forgotten that the company is in the early stages of a period of considerable expansion, the main results of which lie in the more distant future.

Greeff-Chemicals

Greeff-Chemicals Holdings are raising their dividend by 5% to 30% with a final of 25% for 1959. It is also proposed to capitalise £550,000 in a one-for-one scrip issue. The authorised capital is to be increased from £1 million to £1.5 million to provide for the issue.

Basis of accounting for 1959 has been altered so that income from trade investment included only dividends received during 1959 instead of dividends declared payable in respect of 1959, receivable after the end of that year. Group profit was £125,059 (£218,634) and taxation took £59,289 (£92,691).

Cape Asbestos

Group net profits of the Cape Asbestos Co. Ltd. for 1959 were £944,068 (£754,266), the expansion having resulted in a dividend of 20% on capital increased by a one-for-six rights issue. The final is 15% (12½%) on the old capital.

Consolidated Zinc

Increased income for 1959 is reported by the Consolidated Zinc Corporation, who are raising their dividend to 4s (3s) per Ordinary £1 share with a final of 2s 9d a share. Net profit was £2,663,267 (£1,617,876). Allocated for exploration reserves is £280,000 out of general reserves of £950,000.

Matthew Hall

Matthew Hall Co. Ltd. have declared a dividend of 27½% on their capital as doubled by a scrip issue, which compares with 30% for the previous period on the old capital. Group profits after tax were £234,000 (£176,428).

Rio Tinto

Rio Tinto have formed a new company, Nuklear-Chemie und Metallurgie Gesellschaft (Nukem) with Deutsche Gold- und Silbel-Scheideanstalt (Degussa). Nukem are to take over the existing research and production programme of the Degussa nuclear fuel element group and will co-operate closely with the Rio Tinto uranium mining interests. This is part of Rio Tinto's policy to integrate vertically and to spread their interests on a wider geographical basis.

Mr. Gerald Coke, Rio Tinto chairman, believes that demand for uranium will have overtaken supply within the next 15 years. By 1966, U.S. domestic producers of uranium will lose their protection and competition will become keener in the market for uranium and nuclear fuel.

Manchester Oil Refinery

Good prospects for the current year were reported in a recent statement by the chairman of Manchester Oil Refinery (Holdings) Ltd.

Despite limitations on capital expenditure imposed in that year the company had completed extensions to the sulphonate plant, now operating to full capacity. Capital expenditure commitments at the end of 1959 totalled £152,000, and it is expected that this figure will rise substantially in 1960.

During 1959 the refinery has undertaken "a considerable proportion of the blending and delivery of finished products for an old-established private oil company operating principally in North East England. At the same time, by exchange of shares, we have acquired a minority interest in the Ordinary capital of that company." It is believed that the relationship thus established should prove of increasing mutual benefit to both companies.

Negotiations are continuing on the future utilisation of the associated refinery company, Albatros Belge Pour Le Raffinage De Petrole, when the present processing agreement with British Petroleum Co. Ltd. in December of this year. In the meanwhile there is "every reason to believe that our substantial investment in this company is carried at a conservative figure in our books."

George Wimpey

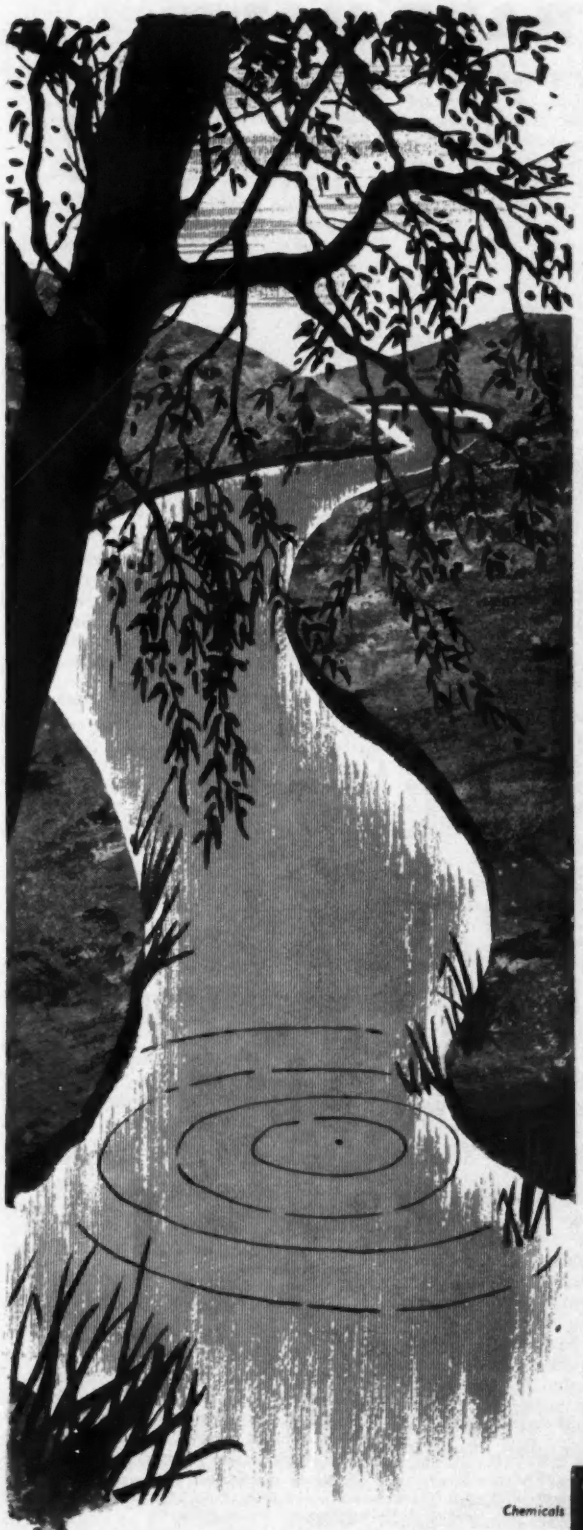
Sir Godfrey Mitchell, chairman of George Wimpey, in his annual review said that the contract for the £2 million extension to the Wilton Terylene plant of I.C.I. had gone well and that completion was nearing on a £2.5 million building and civil engineering contract for Petrochemicals at Carrington. Shell Chemical had recently awarded Wimpey's a £5 million contract for the complete construction of a high-pressure polythene plant.

Construction of the £2.5 million ethylene oxide plant for Union Carbide at Fawley had been substantially completed and a further contract had been awarded by Union Carbide to construct a £2 million extension to the Grangemouth polythene plant. On both contracts, Wimpey had carried out detail design and procurement. Other Grangemouth work had consisted of modifications within the B.P. refinery and construction of foundations for a new polythene plant in association with Stone and Webster Engineering, with whom Wimpey's were also erecting the process plant and equipment for British Hydrocarbon Chemicals.

INCREASES OF CAPITAL

BRITISH SODA CO. LTD., Rookery Bridge, Sandbach, Ches. Increased by £300,000, beyond the registered capital of £200,000.

FISONS LTD., Harvest House, Felixstowe, Suffolk. Increased by £5 million, in £1 ordinary shares, beyond the registered capital of £2 million.



"Clear and gentle stream Known and loved so long"

Robert Bridges.

Water has long excited the imagination of the poet. Streams, rivers, brooks and lakes have been immortalized in song and sonnet. However, no matter how unpoetic it may seem, many a 'clear and gentle stream' contains dissolved impurities, that if left untreated, would render its waters quite unsuitable for industrial use.

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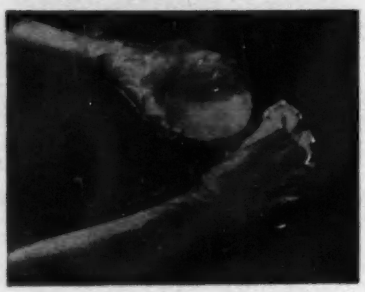

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TRADE NOTES

Solvent Price Reduction

Due to recent extensions of plant capacity and improved processing techniques, the price of Isophorone (a powerful solvent for surface coatings and printing inks, also a good solvent for DDT) was reduced from 9 May by the Chemical Division of the Distillers Company Ltd. The reductions range from £10-£14 per ton depending on quantity; typical prices are: 1-ton lots in drums £225 (old price £237), 10-ton lots in bulk £217 (£231).

Philips Cryogenic Equipment

Research and Control Instruments Ltd., sole U.K. distributors of Philips cryogenic equipment, state that orders are now being met with new versions based on a refrigerating machine with a capacity 50% greater than that of the existing unit. The increase is made possible because the oil pressure operated starting valve and buffer vessel system employed on the PGA 100 machine is now fitted as standard.

Hydrogen Peroxide Price Cut

Further substantial reductions in the price of hydrogen peroxide, ranging between £5 and £12 a ton on 35% strength have been made by Laporte Chemicals Ltd., Luton. The new prices are a result of the successful operation of the company's plants and the rising demand for hydrogen peroxide since the previous cut in January 1959. The reductions apply to hydrogen peroxide 27.5% by weight and higher strengths.

Industrial Gold Plating

Particulars of the bright hard gold plating process manufactured and supplied in this country under an exclusive license agreement with Technic Inc., U.S., are available in the form of a descriptive leaflet, obtainable from Silvercrown Ltd., 178 Goswell Road, London E.C.1.

Change of Name

Croda Ltd., grease and oil manufacturers, etc., Cowick Hall, Snaith, Goole, Yorks, have changed their name to Croda Organisation Ltd.

New Printing Dyestuff

Latest addition to I.C.I. Dyestuffs Division's range of QF vat printing pastes is QF Durindone printing scarlet, R paste, a bright homogeneous scarlet, which "has the advantage of showing notable ease of re-oxidation after steaming". The new dye has very good fastness to light and washing. It is recommended for application by the alkali carbonate/sodium sulphoxylate formaldehyde process and by pad-stream techniques, including the 'flash-age' process.

Rubber Processing Plant

Baker Perkins Ltd., Westwood Works, Peterborough, have made an agreement with the German firms of Leonh Herbert and Paul Troester to manufacture and sell a complete range of rubber processing and moulding machinery previously made in Germany, including bladder-type curing presses both for new and retread work. Troester supply standard rubber processing equipment—including mills, calenders and extruders.

S. and S. Diaphragm Valve

Glenfield and Kennedy Ltd., valve specialists and hydraulic engineers, Kilmarnock, Scotland, having recently reached a licensing agreement with Schmitz and Schulte, Germany, will shortly be able to supply S. and S. diaphragm valves to the U.K. and Commonwealth markets. This valve is of advanced design with many interesting advantages for controlling the flow of liquids and gases.

New Acrylic Dyeing Aid

Dispersol AFB is a new auxiliary specially marketed by the I.C.I. Dyestuffs Division to ensure level results when basic dyes are applied to acrylic fabrics. In liquid form, Dispersol AFB acts by restraining the initial rapid absorption of basic dye, allowing the temperature to be raised rapidly to the boil while at the same time promoting uniform uptake of dyestuff by the fibre.

Etherified Triazine Resins

Production of two new Epok etherified triazine resins is announced by British Resin Products Ltd., Devonshire House, Piccadilly, London W1. They are Epok U.9050 and Epok U.9051, developed for use in a new type of industrial finish which possesses "superior film properties to those obtainable with melamine finishes". U.9050 is supplied as a solution in butanol. U.9051 is a similar resin but the etherifying alcohol and solvent is isobutanol.

Holmes Bag Filters

A leaflet is available from W. C. Holmes and Co. Ltd., Gas Cleaning Division, Turnbridge, Huddersfield, describing a new standard bag filter for less arduous duties than the recently introduced Retroflux design.

Pneumatic Level Indicators

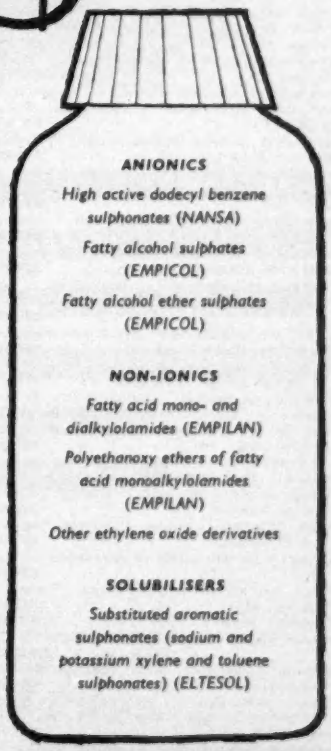
Williams and James (Engineers) Ltd., Chequers Bridge, Gloucester, have just commenced marketing a service of pneumatic level indicators and a novel liquid level controller.

Hermetic Seals

Wesley Coe (Cambridge) Ltd., Scotland Road, Cambridge, have available an illustrated leaflet on the subject of their ranges of glass-to-metal seals suitable for electronic components requiring hermetic sealing. The leaflet also describes the company's services in the fields of production and design work.

Will

Mr. James Fairlie, a former director of John and James White, Ltd., Shawfield Works, Rutherglen, and of H. C. Fairlie and Co. Ltd., Camelon Chemical Works, Falkirk, who died on 2 March, left personal estate valued at £132,310.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High active dodecyl benzene sulphonates (NANSA)
Fatty alcohol sulphates (EMPICOL)
Fatty alcohol ether sulphates (EMPICOL)
NON-IONICS
Fatty acid mono- and dialkylolamides (EMPILAN)
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Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATIONS

On Sale 8 June

Organic compound containing phosphorus and halogen. Ciba Ltd. **723 633**

ACCEPTANCES

Open to public inspection 15 June

Basic heterocyclic diazocyanine dyestuffs and their production. Badische Anilin- & Soda-Fabrik AG. **837 471**

Method and apparatus for production of carbon black. Phillips Petroleum Co. **837 804**

Treatment of solids with liquids. Ruhrchemie AG. **837 428**

Process for preparation of polymers of ethylene which are solid at room temperature. Stamicarbon NV. **837 604**

Preparation of aliphatic carboxylic acids. Rohm & Haas Co. **837 429**

Cyanohydroxy saturated aliphatic carboxylic acids and esters and nitriles of such acids. Rohm & Hass Co. **837 430**

Diisocyanate modified polycarbonates. Hudson Foam Plastics Corporation. **837 895**

Methods for reducing the surface tension of liquids. Minnesota Mining & Manufacturing Co. **837 703**

Thermoplastic mixtures of copolymers. Farbenfabriken Bayer AG **837 704**

Weed-killers. Pechiney Compagnie De Produits chimiques Electrometallurgiques. **837 484**

Cyclopentanophenanthrene derivatives, and method for their manufacture. Syntex S.A. **837 605**

Process for polyalkalene glycol terephthalates. Farbwerke Hoechst AG. **837 438**

Process and equipment for the digestive treatment of sewage sludge. Nishihara, S. **837 561**

Preparation of elastase. Armour & Co. **837 444**

Process for unsaturated perfluorochloro-paraffins of low molecular weight. Farbwerke Hoechst AG. **837 764**

Triaryl phosphate mixtures and the use thereof. Celanese Corporation of America. **837 678**

Mixtures of triaryl phosphate. Celanese Corporation of America. **837 679**

Triaryl phosphate mixtures. Celanese Corporation of America. **837 680**

Process for the production of glutathione. Uclaf. **837 446**

Process for improving polyethylene. Farbwerke Hoechst AG. **837 619**

γ-Glutamyl peptides. Uclaf. **837 447**

Composition of catalyst. Sinclair Refining Co. **837 821**

Esters of hyponitrous acid. Imperial Chemical Industries Ltd. **837 486**

Catalytic reforming of hydrocarbons. British Petroleum Co. Ltd., White, P. T. and Housam, E. C. **837 706**

Method of manufacturing crystallised titanium of high purity and apparatus. Kinzoku Zairyo Kenyusho. **837 905**

Catalysts. Engelhard Industries Inc., formerly Baker & Co. Inc. **837 907**

Thiazole derivatives. Merck & Co. Inc. **837 845**

Sintered body mainly consisting of molybdenum disilicide. Kanthal A.B. **837 454**

Phosphorus-containing polymers derived from 1-aziridinyl compounds. Albright & Wilson Ltd. **837 709**

Process for polymerisation of olefins. Bataafsche Petroleum Maatschappij N.V., De. **837 711**

Process for the manufacture of hydrocarbon substances from coal. Dow Chemical Co. **837 812**

Polymerisation of olefins. Goodrich-Gulf Chemicals Inc. **837 457**

Production of resins from petroleum hydrocarbons. British Hydrocarbon Chemicals Ltd. **837 458**

Method and apparatus for distillation. Cleaver-Brooks Co. **837 498**

Nuclear reactor fuel elements. U.K. Atomic Energy Authority. **837 853**

Precision balances. Oertling Ltd., L. **837 854 & 837 855**

Curing oxidised synthetic oils with SO_2. Esso Research & Engineering Co. **837 826**

Monoazo triazine dyestuffs. Imperial Chemical Industries Ltd. **837 953**

Anthelmintic compositions. Norwich Pharmacal Co. **837 954**

Dehydrogenation or dehydrocyclisation of non-aromatic hydrocarbons. British Petroleum Co. Ltd., White, P. T. and Housam, E. C. **837 707**

Method of making cellular polyethylene. Dow Chemical Co. **837 504**

Handling of sodium dispersions. National Distillers & Chemical Corporation. **837 963**

Electrodialytic cells. Permutit Co. Ltd. **837 460**

Amines and processes for their preparation. May & Baker Ltd. **837 965**

Process for epoxy resins. Bataafsche Petroleum Maatschappij N.V., De. **837 745**

Phosphorus-containing polymers derived from 1-aziridinyl compounds. Albright & Wilson Ltd. **837 710**

Method of fluorinating organic compounds containing other halogens. Wasag Chemie AG. **837 346**

Epoxides. Columbia-Southern Chemical Corporation. **837 464**

Continuous production of 2-methyl butene-1 or its homologues. Petrochemicals Ltd. **837 350**

Cross-linked copolymeric polyesters. General Aniline & Film Corporation. **837 926**

Preparation of hydrocarbons. Imperial Chemical Industries Ltd. **837 362**

Salts of thiodiglycolic acids and their preparation. Uclaf. **837 467**

Phenylcyclohexane compounds. Parke, Davis & Co. **837 747**

Alkylaminoacyl - 2 - methyl - 6 - carbalkoxyanilides. Farbenfabriken Bayer AG. **837 715**

Monoazo dysetuffs derived from aminopyrazoles and their metal complex compounds. Sandoz Ltd. **837 716**

Recovery of fluorine from fluorine-containing waste gases. Pour l'Industrie De l'Aluminium S.A. **837 796**

Aralkyl carbamates and ataractic compositions. Siegfried AG. **837 718**

Platinum metal alumina catalysts. Engelhard Industries Inc. **837 590**

Morphinan derivatives and a process. Hoffmann- La Roche & Co. AG., F. **837 512**

Copolymers of *n*-vinylpyrrolidones with dialkyl maleates or fumarates. General Aniline & Film Corp. **837 719**

Method for preparation of N-substituted derivatives of imido-diphosphoric acid. Benckiser Gesellschaft Chemische Fabrik, J. A. **837 516**

Process for absorption of oxygen. Ruhrchemie AG. **837 517**

Oil-modified resins. Distillers Co. Ltd. **837 876**

Process for making pure columbium and tantalum. Timax Corporation. **837 722**

Process for making cellular polymer bodies. Dow Chemical Co. **837 723**

Anthraquinone dyestuffs. Farbenfabriken Bayer AG. **837 935**

Process for alcohols. Gulf Research & Development Co. **837 799**

Process for purification of an ester of terephthalic or isophthalic acid. Bataafsche Petroleum Maatschappij N.C., De. **837 936**

Imidazole derivatives and processes for their preparation. Soc. Des Usines Chimiques Rhone-Poulenc. **837 838**

Catalysts. Du Pont De Nemours & Co., E.I. **837 535**

Reserpic acid esters and salts thereof and process. Ciba Ltd. **837 840, 837 879 & 837 947**

Reserpic acid diesters and salts thereof and process. Ciba Ltd. **837 841, 837 948 & 837 949**

Compositions containing dihydrodesoxystreptomycin or its salts. Soc. Des Usines Chimiques Rhone-Poulenc. **837 392**

Process for preparing copolymers. Solvic S.A. **837 397**

Process for the catalytic desulphurisation of hydrocarbon oils. Bataafsche Petroleum Maatschappij N.V., De. **837 401**

Production of acetylene. Union Carbide Corporation. **837 537**

Polymerisation of olefins and catalysts therefor. Petrochemicals Ltd. **837 538**

Polyglycol ether derivatives and process. Ciba Ltd. **837 950**

Process for dihydroxy-carotene compounds. Hoffmann-La Roche & Co., A. G. F. **837 408**

Process for the catalytic dehydrogenation of alkanes. Bataafsche Petroleum Maatschappij N.V., De. **837 688**

Process for polymerisation of diolefins. Bataafsche Petroleum Maatschappij N.V., De. **837 689**

Intermediates for production of glutathione. U.C.L.A.F. **837 448, 837 449 & 837 450**

Open to public inspection 22 June

Expanded plastic materials and blowing agents for producing them. Whiffen & Sons Ltd. **838 064**

Anthraquinone dyestuff compositions. Imperial Chemical Industries Ltd. **838 355**

Process for modifying synthetic condensation polymers. Du Pont de Nemours & Co., E. I. **838 412**

Stabilisation of s triazinylamino compounds using a phosphate buffer. Imperial Chemical Industries Ltd. **838 377**

Polyamide compositions. Chemstrand Corp. **838 012**

Nitro dyestuffs containing the triazine nucleus. Imperial Chemical Industries Ltd. **838 338**

Preparing formaldehyde in stable form. Borden Co. **838 097**

Cobalt and chromium complexes of metallizable monoazo dyestuffs and their use. Geigy AG., J. R. **838 791**

Derivatives of 1:3:5-triazanaphthalene. Anchor Chemical Co. Ltd., and Rydon, H. N. **838 015**

4,5-Epoxy-3-ketosteroid compounds and the preparation thereof. Soc. Farmaceutici Italia. **838 771**

Stable beta containing alloys of titanium. Crucible Steeel Co. [Addition to 776 440.] **838 519**

Thioxanthones. Ciba Ltd. **838 706**

Vinyl heterocyclic nitrogen compounds and polymers thereof. Rohm & Haas Co. **838 817**

Monoazo dyestuffs derived from cyanuric chloride. Imperial Chemical Industries Ltd. **838 340**

Aminoalcohol-N-sulphonic acid compounds. Upjohn Co. **838 709**

Polymerisation process and apparatus therefor. Phillips Petroleum Co. **837 974**

Treated glass fibres and compositions for use in same. Owens-Corning Fiberglas Corporation. **838 019**

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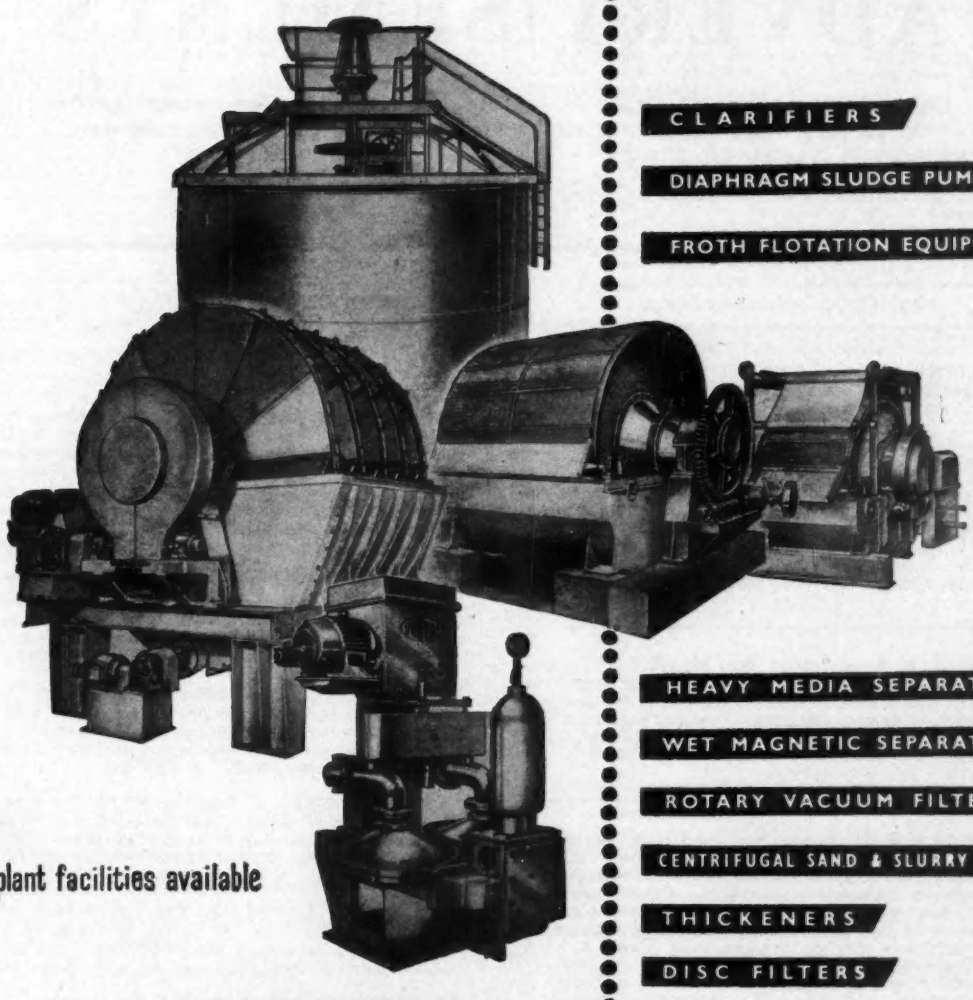

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Imperial Chemical Industries Ltd.,
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CHEMIST (B.Sc. or A.R.I.C.) is required for interesting and varied investigations in the User Laboratory. Salary from £625 p.a. with F.S.S.U. benefits. Applications to Director, British Gelatine & Glue Research Association, 2a Dalmeny Avenue, London, N.7. by 16th May, 1960.

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SITUATIONS VACANT: continued

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Applications are invited for the above post, which is located at Stafford.

Candidates must possess a Higher National Certificate in Chemistry or an equivalent recognised qualification, have had some years experience in the chemical control of Gas Works Plant and be capable of assisting in the training of junior staff.

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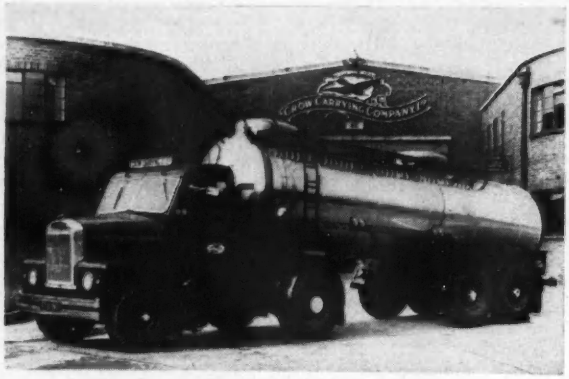

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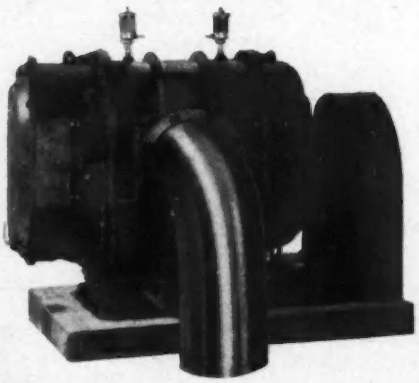

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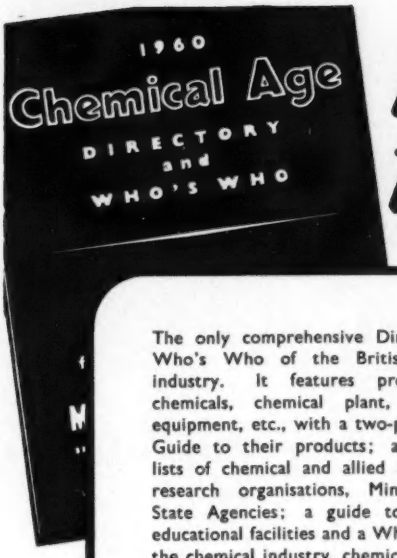

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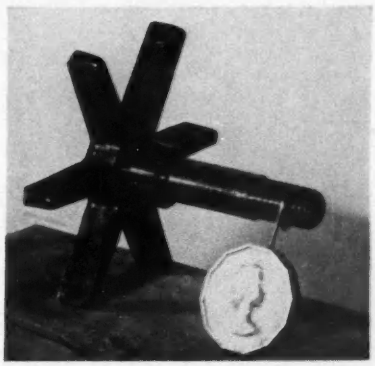

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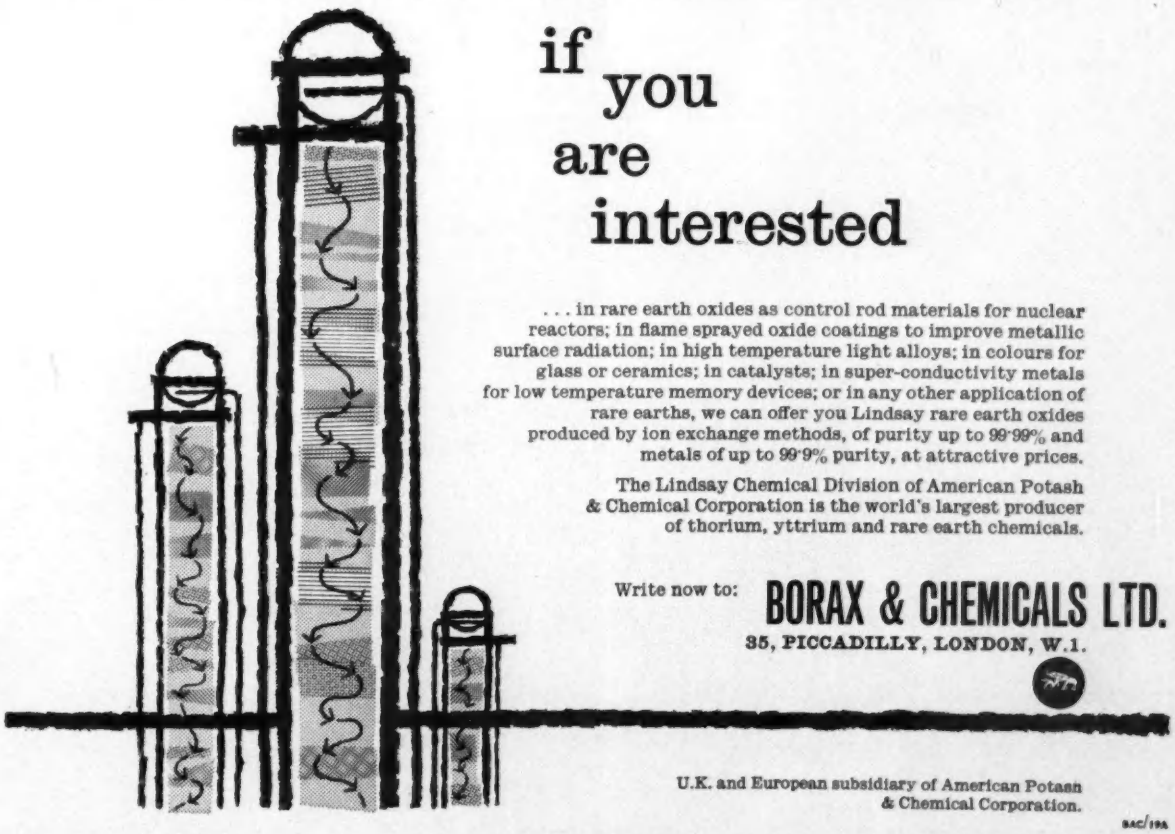

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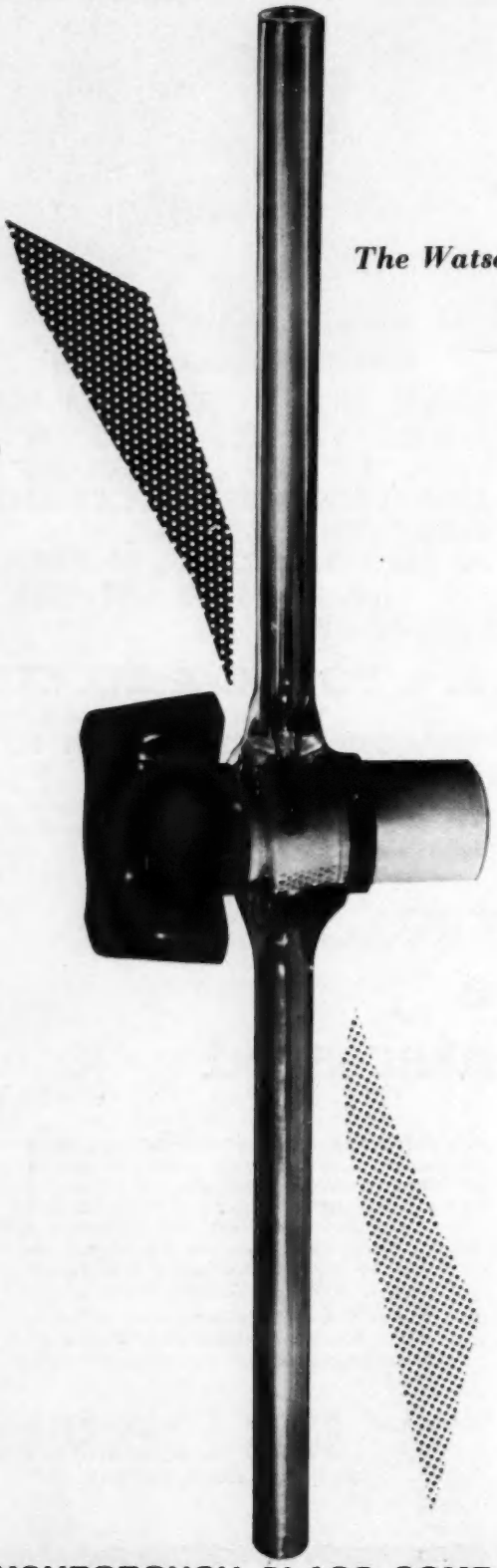

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